BULLETIN **FIELD MUSEUM OF NATURAL HISTORY**

Volume 38
Number 1
January 1967

SHOUT
SHARE
IT

Looking over the Field

by Keith Lupton
Associate Director, Extramural Department, Antioch College
and Patricia M. Williams

SEVERAL TIMES a year the Museum staff is enlivened by the appearance of an assortment of Antioch College co-op students. These students perform many and varied services throughout the Museum which may be summarized by this excerpt from a citation of appreciation presented to the Museum in 1956 by Samuel B. Gould, then President of Antioch College, Yellow Springs, Ohio: "They have cleaned skulls, split shale, prepared fish skeletons, made card catalogues, mounted plants, sorted pieces of pottery, pinned insects, catalogued geologic maps, prepared albums of pictures, reconstructed fossils, and done many of the chores required for the maintenance of a large museum whose primary purpose is education."

In addition to their work-tasks, the Antioch students have for years been providing Museum staff members with anecdotes which have become richer and more elaborate with the telling, until they are now an integral part of Museum lore. The humor is often wry, sometimes rueful, but always shows an appreciation of both the on-the-job capabilities of the students and of their achievements in post-Museum years.

That this appreciation is justified is proven by a brief list of the professions now involving Antioch–Field Museum alumni. Among those known are three college professors, four librarians, five public school teachers, a wildlife technical editor, marine biologist, anthropologist, museum technician, recreational land use planner, an artist, an art dealer, food production manager, copy editor, transportation planner, psychologist, social worker, designer, childcare counselor and the usual number of housewive

Further, six of these graduates have obtained their Ph.D.'s and at least five more are working toward their's. Over half of this group have their Master's degrees—many of them in museum-related fields including two in geology, two in anthropology, one each in resource development, zoology, wildlife management, library science, botany, and two in biology. Even the professor of Political Science has settled in the politics of natural resources development as his major professional interest.

The Museum staff has long been assessing the Antioch students—both offi-

cially and otherwise. As suspected, the co-ops have made a few assessments of their own and in late 1965 and the spring of '66 those who worked three or more months in the Antioch–Museum program were asked to put some of their opinions in writing.

Of the 177 Antioch students employed as co-ops by the Museum, the survey reached 65, and of these 40 students responded, providing thoughtful answers to the questions asked of them.

On the question "*Do you feel that your experience at the Museum influenced your choice of field of concentration?*" the alumni were evenly divided. A New Zealand scientific officer with a Ph.D. in Botany who had worked in the Zoology Department said, "*Yes. It was important in determining my interest in biology and as the result I majored in biology. K. P. Schmidt, at that time Chief Curator of Zoology, also strongly advised studying outside the U.S.A. which later I did (one year graduate study in the Netherlands).*" A professional librarian who had worked in the Museum Library agreed, "*Yes, in a way. I had already decided to become a librarian, but not necessarily a natural history librarian.*" So did a wildlife technical editor who had worked in the Geology Department. He wrote, "*Yes. It was my first working experience in the natural sciences. I was intrigued by the opportunities I discovered.*" Another alumnus, now in social work, found value in a negative aspect of the Museum work experience; his quote, "*Yes. I had been contemplating Geology as a major and from this experience I decided against it. This was a blessing for me and for the Field of Geology.*"

The question "*Was the Museum work experience helpful to you in establishing your vocational orientation?*" resulted in another even division of replies.

A graduate student majoring in evolutionary biology who had worked in the Botany Department said, "*It gave me an inkling of what taxonomy and paleobotany are all about; helped me to realize I liked field work, teaching better.*" A Ph.D. student in the history of science at Johns Hopkins University who had worked in the Anthropology Department felt that, "*It strengthened my desire for an academic life and I am definitely considering museum work after my degree.*"

The next two quotes indicate that, although a scientific institution, the Museum's aid to vocational orientation is not restricted to scientists. "*My chosen field is art. Contact with ethnological collections increased my awareness of world art forms and increased my interest,*" said a candidate for Master's degree in art education at N.Y.U. who had worked in the Anthropology Department. "*Before opening my own art business, I worked for five years running Craft Cottage Industry in the Andes of Peru, Ecuador and Colombia. I also set up marketing corporations for Latin American governments on a contract with the Alliance for Progress (State Department),*" from an art dealer specializing in pre-Columbian–Peruvian art who had worked in the Department of Anthropology.

In response to the question "*Did the Museum increase or decrease your interests in natural science?*" eighty-five per cent of the alumni stated that their interest in natural science had been increased.

Antioch College has long known that both the job and living situation are valuable educationally and personally, thus the question "*Did living in Chicago and working at the Museum contribute to your personal maturity?*" Ninety per cent of those responding said it had. One former co-op, now a Ph.D. candidate in anthropology, who had worked in the Anthropology Department said, "*I seriously believe so. At the Museum I was given responsibility and then recognition when I succeeded. It was here I gained much of the respect I have for the labors of the field in which I am now engaged.*" A graduate student in evolutionary biology who had worked in the Botany Department felt he had "*Learned to live in apartment, shop in big city, learned what streets were safe, and when, learned the problems of transition neighborhoods by participating in Quaker work camps. Learned to be part of the nine-to-five crowds.*" A New York artist-teacher who had worked in the Museum Library, "*enjoyed seeing the differences and similarities of another large city. The isolation of being in that vast city and vast museum built up my self-reliance.*"

And lest you begin to feel that you are reading "Pollyanna Goes to Antioch," there is this bit of leavening ". . . *I feel Chicago is a dreadful city and little would be lost if Lake Michigan moved in and covered it up—slums, corruption, miserable climate and all,*" from the New Zealand scientific officer.

Most Antioch students have about six different employers during their undergraduate years, providing a wide field for comparison. To the question requiring the alumni to evaluate the Museum work experience in comparison to others, seventy-eight per cent found it a helpful one for a variety of personal and professional reasons, such as contact with prominent scientists, experience in field of academic interests, familiarity with valuable collections, exposure to scholarly atmosphere. The question, "*Was there anything about the Museum work experience that was particularly helpful to you as contrasted with other work experiences?*" drew responses citing some less obvious Museum values. Some are "*Long lunch hour (one hour) so I could pursue additional interests in the museum,*" and "*Mainly I think, the lasting influence has been the fine, human qualities of the people there. There was an obvious respect for one another not always found in other places,*" and "*Museum personnel savour their work rather than endure it. Also, I felt my work was important, not routine, as other jobs had been.*"

A second work-evaluation question "*What did you like most, and least, about your Museum work?*" affords greater insight into the alumni's reactions. Many alumni only indicated what they liked most, some responded plurally as to their likes and dislikes, and three happily said that they liked everything!

Nineteen alumni (nearly half), indicated that they most liked the people with whom they were associated, mentioning particularly their friendliness and dedication. The work itself and the "atmosphere" were the next most popular categories.

Interestingly enough, the work itself was high on the lists of both least-liked and most-liked aspects of the Museum job. The only other "dislike" attaining a measure of unanimity was low pay. (A pay raise effective Oct. 1, 1965 has since been favorably received.) Other leaders among the least-liked were typing, working conditions, "hostile attitude of some," prejudice against females on trips, dusting storerooms, pasting photographs, lack of challenge, and feeding snakes.

Only 18% of those surveyed have had any contact with the Museum since their co-op student days—one joined

(*Continued on Page 7*)

TODAY OUR TECHNOLOGY enables us to reach from Earth into the Solar System and beyond so that planets, satellites and other extraterrestrial bodies are coming under closer scrutiny than ever before. In these efforts special interest centers on the "terrestrial" or earth-like planets, Mercury, Venus, Earth and Mars, here given in order of increasing distance from the Sun. Although we will deal with Venus in this article, it is useful to consider briefly the more general subject of the "planetology" of the terrestrial planets as a whole.

Among the terrestrial planets, Mercury and Mars are the smallest, with diameters less than twice that of our Moon. By contrast, Venus is only a little smaller than Earth and is of practically the same density, so that it seems safe to infer that these two sister planets are made of approximately the same types of materials. All the terrestrial planets are be-

THE SURFACE OF

lieved to be composed of rock, although their varying sizes and densities indicate that the dominant type of rock may vary from planet to planet.

Also, because of their different sizes and distances from the Sun, the terrestrial planets represent a series of radically different environments with respect to the chemical and physical nature of their surfaces and atmospheres. They are thus valuable subjects for studies in comparative planetology. Such study may reward us with much information about the origin and history of the Solar System and our own Earth, and perhaps of the development of life itself. From the nature of these problems, we know that the processes involved depend crucially on the chemical constitution of the environment and more particularly on the chemical behavior, or reactivity, of planetary materials. By this we mean whether or not the prevailing temperature and pressure conditions will give rise

VENUS

BY ROBERT F. MUELLER FIELD MUSEUM RESEARCH ASSOCIATE AND ASSISTANT PROFESSOR OF PETROLOGY, UNIVERSITY OF CHICAGO

Photograph of Venus-Regulus conjunction taken by PETE D. TURNER *of Boulder, Colorado*

to chemical compounds similar to those formed on the Earth or whether quite different substances are to be expected.

To answer these questions we must first consider the type of chemical reaction most fundamental to planetary studies—the reaction which may occur between atmospheric gases and surface rocks. It is this type of reaction which governs not only the kind of atmosphere which can develop, but also the detailed characteristics of the surface. We know that the minerals of rocks contain many gases in chemical combination and that these gases are released when the rocks are heated, and absorbed when they are cooled. The more significant of these reactions involve oxygen, water and carbon dioxide since these gases play important roles in mineral and organic processes including the metabolism of living things. These reactions may be represented:

(1) oxidized rock⟷unoxidized rock + gaseous oxygen
(2) hydrated rock ⟷ dehydrated rock + water
(3) carbonated rock⟷decarbonated rock + carbon dioxide.

The reversed arrows are used to indicate that these reactions may proceed either to the right or to the left. It is well known that all these reactions proceed to the right (→) more strongly as the temperature is increased. However, for each reaction a certain minimum temperature is required before the reaction can take place at all, either to the right or the left.

If, for example, we consider a cold planet such as Mars, we know from astronomical measurements that the average surface temperature is so low that all three types of reaction should be practically "frozen" on the surface. However, since planetary temperatures should increase rapidly with depth it is possible that the reactions are effective deep within Mars' interior, and that the observed atmospheric gases of this planet are the result of leakage from this hotter region.

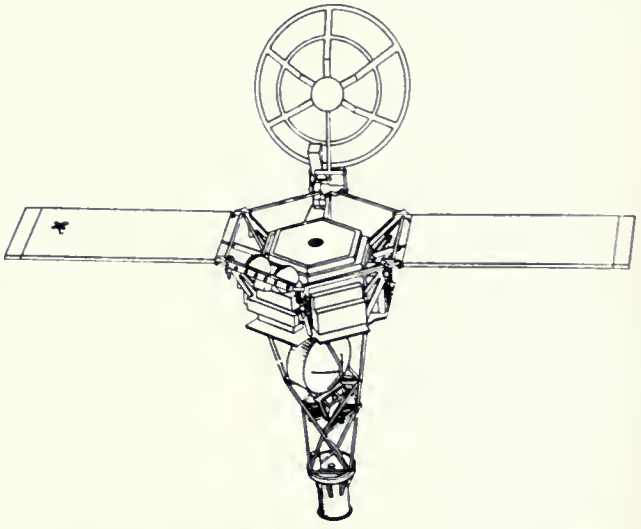
In general, the average temperature of Earth's surface is also too low for these reactions to be very effective. One result is that green plants produce oxygen by photosynthesis much faster than it can be absorbed by rocks (according to reaction 1). This, of course, is fortunate for air-breathing animals. It is to be expected that as in the case of Mars, other atmospheric and surface substances, such as carbon dioxide and water, have their source in the deep interior of our planet where the temperature is high enough to drive the reactions to the right. We must bear in mind that for carbon dioxide the relationship is apt to be very complex, since this gas is used by plants in making food for themselves.

The Origin of the Venusian Atmosphere

During the last decade we have learned a great deal from the analysis of light and radio waves emitted by a planet or reflected from its atmosphere or surface. Some of this critical information was obtained from the space probe Mariner II. One of the most important things we have learned from these sources is that Venus is quite hot, perhaps as hot as 800° F. on the average. This is of particular importance to planetary studies because of its profound effect on the chemical reactions, as we have already discussed.

The high temperatures of Venus are accompanied by an atmosphere peculiar in the extreme by our standards. For example, oxygen comprises 21 percent by volume of Earth's atmosphere, whereas on Venus this constituent occurs in such extremely minute quantities that actually it never has been detected at all. Water, too, is scarce on Venus: one would expect that the high temperatures would boil away oceans of water into the atmosphere, and yet barely a trace has been observed there by use of the most sensitive instruments. By contrast to the apparent extreme scarcity of oxygen and water, carbon dioxide is perhaps 100,000 times more abundant in Venus' atmosphere than in ours. The explanation for these chemical peculiarities can be provided by experimental and theoretical chemistry.

We have already seen that chemical reactions between rocks and atmosphere not only require a minimum temperature to be effective, but also that these reactions run to the right faster with increasing temperature so that the higher the temperature, the more gases are liberated into the atmosphere. Chemistry tells us that with Venus' high surface temperature, the minimum threshold for reactivity should be exceeded for all the reactions, and that contrary to the case of Mars and Earth, we should expect these reactions to exert profound control over the atmospheric composition. Although we know that the high temperature will cause all three reactions to emit more gases into the atmosphere, we must be careful to differentiate between them. For example, although reactions 1 and 2 will liberate oxygen and water from the Venusian rocks faster than they do from the rocks of Mars and Earth, they still do so at a rate so low that they can produce only minute quantities of free oxygen and water. This is especially true of oxygen, and in order for significant



Schematic drawing of Mariner II. Light and radio waves emitted or reflected by planets were measured on its 1962 space probe. This information formed a basis for estimates of the average temperature on Venus.

or even measurable quantities of this gas to be produced, Venus would have to be several times as hot as it is! The real effect then of these reactions is actually to bring about the *absorption* of any oxgen or water which might be produced by other means, such as photosynthesis. Thus, the low observed value of these constituents in the atmosphere is actually in good agreement with chemical theory.

Considerations based on this theory also inform us that

reaction 3 should run to the right with great rapidity, and this again agrees with the great abundance of observed carbon dioxide in the atmosphere of this planet. When similar calculations are applied to countless other chemical compounds, in general they tell us that the high temperatures tend to favor the simpler molecules. They also tell us that in general, conditions on a hot planet such as Venus should be simpler than on cooler bodies where more complex substances can form and persist. Of course, life as we know it depends on these complex substances, so that from almost any standpoint, living creatures should find Venus hostile to their origin and even to their survival.

The Nature of the Venusian Surface

We may also ask what effect the high temperatures will have on the character of the Venusian surface and what rocks and minerals we are likely to find there. First, we may say that the similarity of the size and density of Venus and Earth favors the idea that these planets have had internal histories at least roughly similar. This means that we should expect mountainous zones on Venus similar in horizontal extent to those on Earth. Some recent radio-telescopic observations seem to confirm this idea. However, some important modifications may affect the Venusian mountains as a consequence of the higher surface and crustal temperatures. Curious as it may seem, even solid rocks are weakened by heat; and weak rocks could not be expected to stand very high as mountains, unless the elevating forces were exceptionally strong. Therefore, it seems likely that the Venusian mountains might be somewhat less impressive than our own in terms of height, although they may occupy fully as much area.

Because of the similarity of scale, Venus should also have a crust of at least roughly the same composition, since this feature is derived by differentiation of deep-seated material. The most abundant mineral of our own crustal rocks is feldspar, and we should expect the same of Venus, so that basalt and granite, the familiar terrestrial rocks, should also bulk large on Venus. But we cannot carry this analogy too far, since we know that the higher temperatures will prevent the formation of any mineral which contains too many dissolved gases. This would be especially true of such minerals as clays, which contain water and which make up much of Earth's soils and sediments. It may also be true of certain mica and hornblende-bearing rocks which are formed at high temperatures on Earth, for these also have water in them.

The picture that emerges of the Venus surface is certainly a bleak one in many respects: rather subdued mountains or hills, and plains unrelieved by bodies of water or vegetation, probably swept by continuous dust storms which agitate the heavy dry atmosphere of noxious gases. Yet it is also possible that some curious and interesting sights might be revealed to a close observer. For example, in such an environment we might observe minerals grow before our very eyes or dissolve just as rapidly in the atmospheric gases. Conditions might also favor the deposition of valuable ores directly on the surface, rather than deep in the crust as on Earth, so that the Venusian surface might be of enormous technologic and economic interest. Answers to these and other speculations are eagerly expected from future probes of this planet.

Looking over. . . *(continued from page 3)*

the Southwest Archaeological Expedition in 1957 and 1958, one married a staff member, and another has been on the Museum staff for nine years.

The final question in the survey was "*What advice would you give the Museum, the school and current students regarding the Museum program? How can it be improved?*" The alumni gave advice with gusto and good sense. Much of it is pertinent only to those engaged in the work experience program, but the following may be taken as good advice not only to the co-op but to anyone in any job. "*From my experience there and that of others I have talked to, initial assignments are very routine, and could become tedious if the student allows. The more complex and interesting tasks are given when the co-op shows by performance and attitude that he is ready to accept them. This is good, but may be disconcerting to the beginner who expects to jump in at the top,*" from an elementary school teacher who worked in the Library.

As all good questionnaires should, this one provoked a desire on the part of many to express "just one more thing." For example, this from a museum exhibits technician who worked in the Geology Department, "*If the Field Museum has not yet opened its various art departments and preparation labs (model making, taxidermy, habitat group construction) to students, then a vast source of wealth is remaining untapped in the area of co-op training, for there is so much there to indicate a direction to follow toward one's career. Careers are there that one could never imagine except by touring the laboratory labyrinth. I hope that the atmosphere prevails yet, for to me the epitome of "Museum" resides in Chicago.*"

A concluding quotation reflects the sometimes surprising individuality typical of both the Antioch students and the Museum personnel in their approaches to jobs, life, and one another. Perhaps it is this very individuality which has made the program a success.

"*I hope I may be pardoned a final personal note. I had spent World War II in a camp for conscientious objectors and went directly from the camp to the Museum. I was not sent to the Museum by Antioch and perhaps was not officially a co-op student. I went to the Museum at Mr. Dawson's suggestion but without an official letter of introduction. I was hired by a retired military man, a colonel, I believe. He questioned me briefly about my status as a conscientious objector, cautioned me about the possibility of discrimination on the part of other employees, and hired me without ado. His willingness to hire me at a time when I needed the Museum more than the Museum needed me was broadminded and generous on his part, and I have always been grateful for it.*"

Specifically, this survey indicates that the Field Museum has contributed significantly to the preparation of at least 14 Antioch alumni who are now professionally engaged in work related to that done at the Museum, and at least seven others still in graduate school preparing for related work.

The Museum intensified most of the students' interest in natural history and has helped them in important decisions concerning their futures. By their own admission, working at the Museum effected subtle changes in the personalities and thinking of several dozen now staid and mature Antioch alumni. In return, the Antioch co-ops have provided a fillip of youth—occasionally deflating, often exhilarating, and always refreshing to the Museum staff.

picture making by Apes and its evolutionary significance

by A. L. Rand
Chief Curator, Zoology

THE PICTURE MAKING ABILITY of chimpanzees first received recognition in 1957 when Betsy and Congo had a two-chimp exhibit at the Institute of Contemporary Art in London. In the same year, the work of Zippy was exhibited in the Senate House Museum, Kingston, New York. Eight paintings by these chimps are now on exhibit here at Field Museum. The paintings, the gift of the late Mrs. Emily Crane Chadbourne, are now a part of the study collection of the Zoology Department, as an illustration of the behavior of great apes in a field considered restricted to man.

Congo, an experimental animal studied by Mr. Desmond Morris of London, was a television personality who made 384 pictures between 1956 and 1959 when he was two to four years old. Much of his color work was done with a brush. At his London show, some pictures sold well at inflated prices, after which the others were withdrawn from the market and filed for documentation and study. Much of what we know about the biology of chimpanzee art comes from Morris' studies at the London Zoo. His book, *The Biology of Art*, deals with these studies.

Betsy of Baltimore, also a zoo animal and television personality, is best known for her finger paintings, the sale of which helped fill the coffers of the Baltimore Zoo. Zippy is a less well-known figure. She worked in a Washington department store painting pictures for sale, some of which Mrs. Chadbourne purchased.

It could be argued that this material belongs to the study of art, or that since it throws light on certain aspects of the innate behavior of man, it belongs in anthropology. True, it can be used in either of these. But here, we view it in the wider context of the whole evolutional process, making it properly zoological material.

One must accept that real and important ideas can emerge from the study of this ape picture making. Because it is so easy to burlesque picture making by non-human primates, the main point may be missed—that though these ape artists offer an obvious opportunity to deflate some pomposities of the art world, their picture making is not at all a zoological joke. It takes a discerning eye and a receptive mind to see them for what they are: documents and records of a biological approach to art.

The show in London was opened by the noted British biologist, Sir Julian Huxley, who maintained that the pictures by Congo and Betsy showed that chimpanzees had artistic potential. By inference, our ape-like ancestors had this primitive artistic potential to which man has added his unique capacity for symbol making.

Morris shows that the chimp-painted pictures have basic artistic qualities. They show composition control, calligraphic development, and aesthetic variation. These characteristics appear only at a minimal level, it is true, but they are there, the basic fundamentals of aesthetic creativity.

From the point of view of evolutionary studies in biology, the intricacies of art need not concern us beyond establishing, as Morris has done, that the aesthetic potential of *Homo sapiens* has its roots in a similar open-pattern instinct of a pre-human ancestor, and that traces of it can be found in present-day sub-human species. (An open-pattern instinct is one which is susceptible to modification by experience and in some forms is capable of being codified into traditional behavior. A closed-pattern instinct is one not modifiable by experience.)

The investigation into animal behavior in terms of open and closed instinctive patterns is in its infancy. It is a study that promises a much richer understanding of animal behavior and its evolution, from lowest to highest forms.

CALENDAR OF EVENTS

Museum open 9 a.m. until 4 p.m. weekdays, until 5 p.m. weekends.

through February 28 Winter Journey: WHO'S WHO IN THE PREHISTORIC ZOO
A self-guided tour of the prehistoric animals hall; direction sheets available at the Information Desk and at both entrances.

January 1–31 EXHIBIT:
PAINTINGS BY CHIMPANZEES
An exhibit of eight paintings by three chimpanzees, and photos of the animals at work. In Stanley Field Hall.

January 15 MOVIE: Sponsored by ILLINOIS AUDUBON SOCIETY
GONE WITH THE WILDERNESS
Karl Maslowski's film features a mink and a moth. In James Simpson Theatre at 2:30 p.m.

MEETINGS:

CHICAGO SHELL CLUB
January 8 at 2 p.m.

CHICAGO NATURE CAMERA CLUB
January 10 at 7:45 p.m.
February 5 at 2:30 p.m.

ILLINOIS ORCHID SOCIETY
January 15 at 2 p.m.

This month's cover shows Duncan Foley, an Antioch College "co-op," working among the hundreds of cases of mineral specimens in our Department of Geology.

FIELD MUSEUM
OF NATURAL HISTORY
ROOSEVELT ROAD AT LAKE SHORE DRIVE
CHICAGO, ILLINOIS 60605 A.C. 312, 922-9410
FOUNDED BY MARSHALL FIELD, 1893
E. Leland Webber, Director
BULLETIN
Edward G. Nash, Managing Editor
Bea Paul, Associate Editor, graphics

PRINTED BY FIELD MUSEUM PRESS

Volume 38, Number 2 February, 1967

BULLETIN **FIELD MUSEUM OF NATURAL HISTORY**

FROM THE OFFICE OF THE DIRECTOR

I am very pleased to tell you about an unusual opportunity being offered to members of Field Museum - a tour of Guatemala, a land spectacular in its beauty and diversity. As the site of many Field Museum expeditions and the subject of many of our publications, Guatemala is a logical first destination for a planned series of Field Museum tours.

One of the greatest strengths of the Museum is its members. People join Field Museum because they are interested in the natural sciences, in our research and exhibit programs - interested in the world around them. It was with this in mind that our Guatemala tour was planned, for it will be something quite different from an ordinary tour.

It has been carefully planned, not just to skim the surface, but to achieve an understanding of the flora and archaeology of Guatemala and a personal acquaintance with its people. Members of the Museum staff will participate in the tour adding their knowledge of the area to the value of the experience. Of particular interest will be visits in the homes and gardens of leading Guatemalans.

The group will be limited to 60 persons, divided into two sections of 30 each. Transportation in Guatemala will be in limousines driven by English-speaking chauffeur-guides, with no more than four passengers to a limousine.

The cost of the trip is $1,260 per person, of which $400 is a tax deductible contribution to Field Museum.

One section of the tour will be led by Phil Clark, our Public Relations Counsel, who has led many garden tours of Guatemala and Mexico and has an intimate knowledge of

Donald Collier

Antonio Molina

Malcolm Collier

Phil Clark

the area. Mr. Clark will also act as a tour botanist. The leader and botanist for the other section will be Dr. Antonio Molina of Honduras, a Field Associate of the Museum's Department of Botany, who has worked for many years in Central America. The tour anthropologists will be Dr. Malcolm Collier and Dr. Donald Collier, Chief Curator of Anthropology who is a specialist in Central and South American anthropology.

I hope that many of you will take this opportunity to join our staff members and me in visiting Guatemala, the locale of one of our important overseas field programs in one of the most beautiful areas in the Western Hemisphere. In the next few pages, we present the itinerary of the tour day by day. Later on in this issue there is an appreciation of Guatemala by Dr. Louis Williams, Chief Curator of Botany, and head of Field Museum's Flora of Guatemala project, one of our most important scientific programs.

All of us hope that tours like this will lead, in future years, to an ever-increasing involvement of the members in the life and work of Field Museum.

Sincerely,

E. L. Webber

E. Leland Webber, Director

Guatemala is the beautiful — and the unexpected. Green and blue parrots, not drab crows, raid cornfields. Tropical jungle and temperate pine forests are within minutes of each other. Ornate baroque stands side-by-side with sleekly modern architecture. The ruins of an ancient and proud culture sit in the jungle silence as they have for centuries. On these pages, Phil Clark traces day by day Field Museum's Guatemalan Tour, designed so that you may come to know the flora, the people, the civilization of Guatemala.

An ancient sculpture at the Museum of Archaeology and Ethnology in Guatemala City.

Busy scene in Guatemala City.

1 *Friday, October 27*—You leave from O'Hare Field, taking Delta Airlines to New Orleans and Pan American to Guatemala City. The temperature will be spring-like but it won't take you long to know you are in the tropics: the huge orange flowers of the tulip trees and the massed magenta of bougainvillea will tell you. Your hotel, the new Ritz Continental, is in the center of the capital. Dinner will be in the hotel's skyroom with a sweeping view of the National Palace Square and the mountain-circled city. After dinner, a talk on tropical fruits by Dr. Antonio Molina, tour botanist.

2 *Saturday, October 28*—This morning you visit the Museum of Archaeology and Ethnology and the partially excavated ruins of Kaminaljuyu, a great ceremonial center of the highland Maya, the foundations of which were laid before 500 B.C. After lunch, a call at the home of don Mariano Pacheco, dean of Guatemalan horticulturists, whose patio is a miniature botanical garden of native plants. Later, a visit to the National Palace, built in the grand style of hispanic houses of state, containing many nationally created art works. A pause in a splendid Spanish colonial church, cocktails with a plantation owner in his townhouse, and, in the evening, a discussion of the ancient and modern Maya with tour anthropologists Donald and Malcolm Collier.

'Midst flowering azaleas, don Craig Hodgsdon welcomes tour members in patio garden.

3 *Sunday, October 29*—This morning you meet José Yurrita, the son of the planter who designed and built Yurrita Church, as thanksgiving for the miraculous rescue of his family after having been buried for three days under volcanic debris. You visit the Church, a strange blend of gothic and hispanic styles. During the afternoon, you visit four private homes and gardens, each one quite different from the others. The first is a gem-like patio garden in the Spanish colonial style; another belongs to the Republic's most daring architect; the third combines traditional Spanish with modern informal landscaping and at the fourth you meet many of Guatemala City's leading citizens at a party in a palatial, traditional home surrounded by sweeping gardens.

Monday, October 30 — You leave for Antigua — the capital of Spanish colonial Central America. Founded in 1543, Antigua was destroyed by earthquakes in 1773. After lunch you explore this city that time forgot. Here are the ruins of some of the 16th Century's most monumental churches—Nuestra Señora de la Merced, San Francisco and others—the Palace of the Captains General, and one of the first universities in the Americas, San Carlos, where a stunning collection of colonial sculpture and painting is displayed. After dinner, a talk by Dr. Wilson Popenoe, a noted authority on tropical horticulture, on the Spanish colonial garden.

4

Founded in 1678, San Carlos University still stands in Antigua.

Royal palms line the entrance to the waterfall gardens of San Pedro Martir.

Tuesday, October 31 — You take an excursion, with picnic lunch, into the tropical lowlands, to visit the coffee plantation of Hugh Craggs, a progressive farmer who tells you how he has achieved the highest coffee yield in Central America and demonstrates the processing of coffee. His handsomely landscaped estate is also well known to orchidists; many orchid hybrids have originated here for this and other plant breeding are hobbies of don Hugh. On your return trip to Antigua, you stop to view the landscaped waterfall of the Grutas de San Pedro Martir.

5

Wednesday, November 1—During the morning, you see an All Saints Day procession at a nearby Indian village, with its strange combination of the Indian and the medieval spirits. For another colorful glimpse of Indian life, you tour the great Antigua market and visit some textile looming shops. During the afternoon you visit several small patio gardens showing varying degrees of modernization of the old Spanish houses, including the completely authentic Casa Popenoe.

6

Black beans are favorites among the many varieties sold in Antigua's market.

Thursday, November 2—Today you take an excursion to the great plantation-garden El Zapote, almost on the rim of the smoking volcano Fuego. The lady of this estate, Mrs. Carmen Pettersen, one of Guatemala's most enthusiastic gardeners, will show her gardens with their artificial lakes of waterlilies and give a talk on her exciting life in Guatemala. The plantation's main crops are the drug quinine and the spice cardamon.

7

Volcan Fuego smokes above an ash-streaked mountainside, seen from El Zapote plantation-garden.

A busy center before the Spaniards came, temples at Iximché now stand deserted.

8 *Friday, November 3*—Today you enter the real Indian Guatemala in the highlands. You pass through Indian villages and stop at the colorful market of Patzun and at the Mayan ruins of Iximché, where temples and pyramids, now silently framing Volcan Fuego, were busy Indian centers when the Spaniards came. Finally, you reach magnificent Lake Atitlán, a volcano-circled oval of brilliant azure, its waters deep and pure. After settling in your cottage at the garden hotel, Casa Contenta, you visit the nearby market town of Sololá, where the men wear gray woolen coats embroidered with stylized black bats, and plaid skirts over striped pajama-like trousers. In the evening, a dance, with marimba band.

9 *Saturday, November 4*—A launch takes you across Lake Atitlán to Santiago Atitlán, a village of Tzutuhil-speaking Indians. The women wear bright red, tightly-wrapped skirts, white huipiles and "halo" headdresses made by winding red ribbon around their heads; men wear white shirts, red sashes and short white trousers embroidered with butterflies. During the afternoon, swimming in Lake Atitlán and a botanical hike along a nearby river are scheduled.

Hand-loomed textiles are offered by girls of Santiago Atitlán.

10 *Sunday, November 5*—Market day at Chichicastenango, 17 corkscrew miles up the mountain through heavy pine forests. When you reach this mountain-top town, you know that here is one of the last strongholds of the Indian in the Americas—the very street mood suggests another, different culture. At Santo Tomás church, clouds of black "pom" smoke rise heavenward from the stairs up which worshippers climb a step at a time. They chant prayers in Maya as did their ancestors in the temples. Inside the church is aglow with candles, and squatting Indians chant, as they sprinkle flower petals on the floor. Dinner at the hotel, the charming Spanish colonial Mayan Inn.

Tikal's great temples loom above the surrounding rainforest.

11 *Monday, November 6*—A hike up the mountain Pasqual Abaj through cornfields and pine-oak forest brings you to the black stone idol of the god Turkaj, still worshipped in the area. Freshly cut flowers and perhaps animal offerings lie before him and smoke and incense still rise before three Maya crosses. On the way back to Chichicastenango, you stop at the mask-maker to examine hand-carved wooden masks of animals and human faces and to watch a Conquest dance. At tea, guide Oscar Martinez gives a talk on the Indians of Chichicastenango.

12 *Tuesday, November 7*—An early start for Quezaltenango, 55 miles to the north, with a stop at the market town of Totonicapan, famous for its colorful woolen blankets. Amazing terraces make patchwork of the steep mountainsides on which corn and wheat are grown. Black sheep are tended by shepherds wearing a sort of Indian kilt in brown and black checks. In Quezaltenango, you visit an hacienda-style home with an impressive library and an unusual columnar Guatemalan holly tree. The recently built Bonifaz, our hotel for the night, is in the Spanish Revival style.

13 *Wednesday, November 8*—The trip back to Guatemala City is via the Pacific road, which passes through lowland jungles. Growing at the roadside are purple sobralia orchids, orchid cacti, tree ferns, Spanish cedar, balsa, and teak trees and fields of pineapple, sugar cane. There are plantations of cacao, banana and coffee. Santa Maria volcano is framed by palms. You stop for a conducted tour of a tropical agriculture station where chocolate, lemon grass, annatto dye, rubber, black pepper and vanilla orchids are grown. Today's trip, one hundred and fifty miles, is the longest day's driving on the tour, through mostly tropical country.

Smoke rises from censors swung on steps of Santo Tomás Church in Chichicastenango.

14 *Thursday, November 9*—An early morning plane across rainforest to Tikal, where pyramids and temples soar over the jungle. Artifacts as old as 500 B.C. have been found here. This was the largest Maya city of the Classic Period, uncovered and partly reassembled by University of Pennsylvania archaeologists in recent years. The period of most active building was 300–700 A.D. The city, probably a religious and ceremonial center, was mysteriously abandoned about 869 A.D. Its magnificent stelae, pyramids and palaces were left to the jungle where amid monkeys and exotic birds it moldered until recent times. You will stay at the simple Jungle Inn, where, after dinner, Dr. Collier will talk about the restoration of the ancient city. The sight of the Temple of the Jaguar in the moonlit jungle is an unforgettable moment.

Guatemala's national flower, the white nun orchid, Lycaste virginalis alba.

15 *Friday, November 10*—A further look at the ruins of Tikal, and after lunch, the return to Guatemala City.

16 *Saturday, November 11*—In the morning, you tour Guatemala City market. In the afternoon, you are on your own. This evening both groups reunite for dinner and a farewell party and program at El Patio restaurant.

17 *Sunday, November 12*—The return to Chicago.

Guatemala: an appreciation

by Louis O. Williams, Chief Curator, Botany

I CONSIDER GUATEMALA my second homeland. It contains more things of interest, for those whose curiosity is not bounded by everyday affairs, than any equal area that I know.

Even though I have been asked to write about Guatemala's plants, I should be derelict in my duty if I did not tell you to see, observe and talk to the Guatemalan people. A friendlier people are to be found nowhere, and more interesting ones are hard to imagine. One must remember that the civilization from which they come is old. It was good and they are justly proud of it and you will be deeply respectful of it too, I am sure, when you see the ruins that remain from a great epoch in their history.

During your days in Guatemala you will see some splendid mountain landscapes, dominated always by volcanoes and volcanic lands. Please notice Santa María volcano when you go to Quezaltenango; it is the most symmetrical cone I have seen anywhere.

It will almost certainly be a day long remembered when you first look down on Lake Atitlán, —far below and the bluest of blue. Look at the shoreline and embayments and count the many gleaming white villages. The volcanoes circling the lake seem to be sentinels standing guard.

One of your days at the lake will be market day at nearby Sololá. Perhaps there are better Indian markets in Guatemala, but this is especially fine for the many colorfully dressed Indians who come in from the surrounding area. Relatively few tourists visit Sololá, for it is somewhat off the beaten track.

The western highlands, "Los Altos," are especially noted for the textiles that are woven there. You will be besieged by vendors of blankets, tablecloths, ties, dress material—all the things that it is possible to weave by hand loom. Selecting judiciously, you can buy some very good things at reasonable prices.

Guatemala is not very big, but its flora was blessed by a benevolent creator. From the sea to the top of the highest volcano, the distance is very small. But the distance in climate and plant habitats is immense. You will especially notice the difference as you go quickly from Quezaltenango down to the coastal plain. Habitat and climate change is greater in those few minutes than that from Chicago to Miami.

If you go out everyday from Chicago into the uncultivated

areas still remaining within 100 miles and if you are a careful and critical observer, you might find two thousand kinds of wild plants during a whole season. An observer would find that number in western Guatemala in only a few days. In all the United States, there are about 15,000 native flowering plants. I don't know how many there are in tiny Guatemala, for its flora is still relatively unknown, but probably there are 10,000. The *Flora of Guatemala* now contains 2,500 pages and when completed will be a work of about 4,000 pages. This indicates the great variety of plants in this small area.

You shall see several radically different kinds of plant associations in Guatemala: those in the hot, often dry, Pacific coastal plain; the rain forests of Tikal; and the subalpine zone of the high mountains, where frost is a common occurrence in winter months, and where some of the finest coniferous forests remaining on the continent grow. A rare but outstanding conifer here is *Abies guatemalensis*, the Guatemalan fir locally called *pinabete*. I think that this is the largest fir in the world. Seen from a distance it is distinctive, for in the forest it appears black. Dr. Antonio Molina, who will be with you, is a specialist on the kinds of Central American conifers and will identify the plants for you.

You will go through deciduous forests of several kinds as you travel. These range from the relatively dry Pacific to the temperate highlands and the wetter region of Tikal. Oaks are common most everywhere, except at the lower elevations, but these trees are not all oaks! When you have a chance, walk into the woods and observe the trees; you will find most are complete, if attractive, strangers, even the oaks.

There is one very obvious difference between broadleaf forests in the tropics and northern regions. In this country you may find a hillside covered with one kind of maple or oak, the population containing literally thousands or even hundreds of thousands of the same species of tree. In Guatemala, this is not so. It will be a poor broadleaf forest in Guatemala where Dr. Molina cannot point out twenty or thirty kinds of trees in a few minutes' walk.

It will be worth your while to go first into a highland forest and then at Tikal to see the kinds of trees that grow in the lowlands. Mostly they will be quite different.

Trees are not the only kinds of plants that you will see in abundance. You will be in Guatemala as the wet season is ending. This is the period when you will find the greatest number of plants in flower.

In the western highlands it is the rule rather than the exception to find several kinds of Salvia in bloom. There are purples, blues and reds, herbs and shrubs, inconspicuous and flamboyant ones.

You will also find *Compositae* (aster family) everywhere at this time. Blue ageratums overflow cornfields, and the woods and open hillsides are pink and yellow and white and brown with daisies and dahlias, growing as trees or as low annuals.

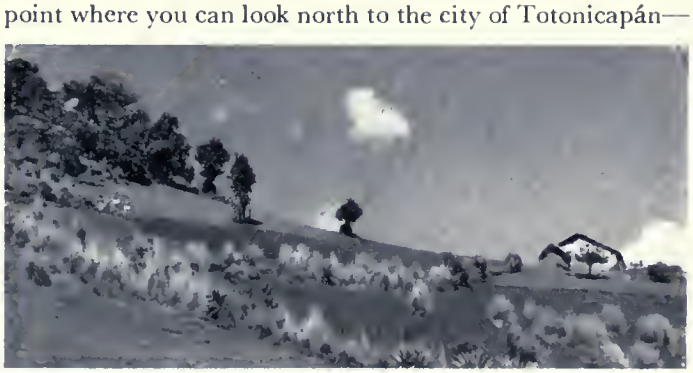
Orchids and bromeliads are found in all the areas that you will visit. These are both interesting. Most are epiphytes, growing on trees but taking nothing from them. Epiphytism is, in part, an adaptation to get away from the competition at ground level and to get up into the sun. There also are orchids growing on the ground, often in great abundance. The road from Quezaltenango down to the coastal plain passes through a canyon where *Sobralia macrantha* covers the slopes. This species produces the largest flower of Guatemala's over 500 kinds of orchids. I hope that you will see it, for although the lavender flower lasts a day at most, it is a sight not to be forgotten.

Naturally, in a country so rich in wild plants, the gardens are colorful almost beyond imagining. Not only are the gardens given an exotic touch by the many plants brought in from the whole tropical world but numerous Guatemalan wild plants are utilized. Phil Clark, who will be one of the plant specialists with the tour, and who has for many years been the garden editor of a Mexican newspaper, will tell you in which countries the plants originated and also tell you something of the Spanish principles of garden design typified by most of the gardens, either modern or traditional.

You will see gardens in a variety of climatic situations which will further widen their styles and plant materials. Gardens will go all the way from a cool 7,700 feet at Quezaltenango to a coffee plantation garden at 2,000 feet, with those in between at 5,000 feet in Antigua and Guatemala City. There will even be one huge garden estate on the side of *Volcán de Fuego*.

Man lives from plants in Guatemala just as he does elsewhere in the world. His agriculture is everywhere to be observed: some of it is rational and not destructive of the land, but much that you will see is wasteful of the non-renewable resource which is the land. A few miles before you reach Quezaltenango, you will observe wheat growing on hillsides so steep that terraces are necessary.

When you stop along the Pan American Highway at a point where you can look north to the city of Totonicapán—



you will view a checkerboard valley of cultivated fields. Most of the forests have been cut away and wheat and occasionally other crops are grown. When I first came to this region more than twenty years ago this whole valley was forested, like other still heavily forested areas which you will enjoy.

Traveling from Guatemala City to the highlands and back again, then up northward to Tikal and back you will see some magnificent examples of tropical vegetation. You will also have brought forcefully to your attention man's dependence on plants.

THE GREAT

Zoology Chief Curato
acquisition of on

THE GREAT AUK, a large, black and white, flightless sea bird of the North Atlantic became extinct in 1844, thus making an unenviable record as being the first North American species to become extinct in historical times. It was followed into oblivion in 1875 by the Labrador Duck (one shot on Long Island), in April, 1904 by the Carolina Parakeet (last seen at Taylors Creek, Florida), and by the Passenger Pigeon (Martha, the last bird, died in the Cincinnati Zoo in 1914). Any self-respecting museum with a collection of North American birds needs examples of all these. The Field Museum already had specimens of the last three, but not the Great Auk.

The chances of ever getting a specimen seemed remote, since the Great Auk had already been extinct for about 50 years when the Field Museum was founded in 1893, and there were only about 80 specimens in existence. Most of them were in European museums, with 9 in America, and museums do not lightly part with such material. Then, in 1966, a colleague of ours, Mr. James Baillie of the Royal Ontario Museum, Toronto, wrote us that they had finally received a Great Auk for their Museum. It was formerly at Vassar College, and was the one Audubon purchased in London before 1836, and painted for his *Birds of America*. More important to us than the transfer of a Great Auk from Vassar to Toronto was Baillie's news that in Brussels the *Institut Royal des Sciences Naturelles* wanted a representative series of North American birds, and might be willing to exchange one of their two Great Auks for it.

We wrote Dr. A. Capart, Director of the Royal Institute, and found he was favorably inclined to such an exchange. We sent him a fairly complete series of strictly North American birds, males, females and young, and received in exchange the Great Auk.

The first news of the arrival of our bird was a telephone call from Chicago customs that they had a penguin for us. An awful thought came to mind. Had they opened the packing case and had it identified by a local bird watcher as a penguin, which a Great Auk superficially resembles? Was it, indeed, a penguin? A man was dispatched, posthaste. My fears were groundless. The case was intact, but the "*Facture pro forma*" was in French and listed the contents as a *Pingouin*. Of course! In modern French texts auks are called *pingouins* and penguins are called *manchots*. As an early historian of the Great Auk wrote, it was known by different names in different places. Anatole France's *Penguin Island* was really inhabited by auks. In nineteenth century England, the name great auk vied with garefowl for popularity, the latter name based on the icelandic *geirfugl*, the gaelic *gearfhul*. The "geir" or "gare" of the name referring to the spear-like bill, while auk is an old English name for the related razor bill.

Our Great Auk, as we now call it, the only one in the United States west of the Atlantic, is a magnificent bird.

Standing upright on its toes, it is about 27½ inches high.

The blade-like bill that gives the bird one of its names has curious grooves across the end and the nostril opens in a slit. The head has a big white patch in front of the eye, but is otherwise black, as are the sides of the neck and all the upperparts except for narrow white tips to the inner flight feathers of the absurdly small wings. The underparts are white, which color ends in a sharp point on the upper neck. The tail is short and the three front toes fully webbed, as in other auk species.

Evidently, it is an adult in summer plumage. As the sexes are externally alike we can't tell if it is male or female. Along with name and number, our specimen has "De. E. de Selys" on the label. It is the specimen that Baron de Selys–Longchamps wrote of in "Ibis" in 1870. During his travels in Italy he saw four specimens in collections there, and also purchased the present specimen in 1840 in Turin, from a M. Verany with whom it had been left for sale, on commission, by M. Verreaux. For a time, the Baron kept it at his place, Longchamps, near Warenne, Belgium, and later gave it to the Brussels Museum. Now it is in the Field Museum in Chicago. Its earliest history we can only deduce. No specimens of undoubted American origin are known and as the chief student of Great Auk history, Alfred Newton, wrote that most of the specimens extant are known to have come from Eldey Island, Iceland, in the period 1830–1844, we can assume this is the origin of our Great Auk. There is one minor corroborating detail. A superficial examination of the specimen suggests that it has been skinned through a cut across the lower abdomen between the legs, in the same manner as Icelandic foxes and other specimens prepared by Icelanders. (Another method for auks was to make a slit under the right wing and stuff the skins with fine hay.)

The value placed on Great Auk specimens in the 1800's, when people of substance were stocking their cabinets with show pieces, is best appreciated by realizing that a Great Auk was a gift worthy of a king. Baron de Selys–Longchamps, once the possessor of our specimen, wrote in 1870 that the Marquis de Breme, Grand Master of the Royal Household, gave his collection of birds, including a Great Auk, to King Victor Emmanuel who housed it in the Veneria Reale, Turin. At the request of the King of Portugal, Victor Emmanuel's son-in-law, also distinguished as a patron of Ornithology, this Great Auk was presented to the Museum in Lisbon in 1867, where it is today. Later, the King of Italy was able to replace it in his collection with another, transferred to the Museo de Zoologia, Rome, in 1902, with the rest of the King's collection. As well as illustrating the value placed on such material, this illustrates how the private collections helped save early natural history material, preserving it until it flowed finally into public museums by donation or purchase.

AUK COMES TO CHICAGO

ustin L. Rand tells about Field Museum's recent, but long-awaited
f the 78 remaining specimens of the extinct Great Auk

Taxidermist Carl Cotton gingerly unpacks Great Auk after its passage from Brussels. Close examination revealed that the bird completed the trip unscathed. At right, Mrs. Hermon Dunlap Smith, Associate in Birds and President of Field Museum's Women's Board, who managed the difficult and time-consuming details of our exchange, and Emmet R. Blake, Curator of Birds, admire the Great Auk.

This is a trend that is still going on.

But some Great Auks did go through the market places. Priceless as they are to museums in showing the kinds of things that exist, commission merchants and traders did put a money value on them. A few examples of this may interest our readers.

In the early 19th century, Great Auks changed hands for as little as £2 and as much as £15, with prices in other currencies quoted as 200 francs, 50–200 florins and 20 thalers. In the late 1800's the prices had risen and two mentioned are 600 dollars gold and £350. The latest I've seen, 1934, in a London sale: two Great Auks from the estate of a Mr. G. D. Rowley, one priced 480 guineas, the other, 500 guineas. Our exchange, a suite of North American birds, was not cheap. Much time and effort would have gone into starting from scratch and building up such a collection. This is not the first such exchange that has been made. In 1860, a German naturalist acquired a Great Auk specimen in exchange for the skin of an Indian Tapir.

There has been a great deal written about the Great Auk. Most of it is from the viewpoint of an antiquarian. No naturalist ever studied the living bird and what is known of its biology is collected from many scattered sources. The Great Auk, *Alca impennis* of Linnaeus, *Pinguinus impennis* of present-day ornithologists is classified in the Family Alcidae which also includes such well-known birds as razorbills, murres, dovekies, gullimots, murrelets, auklets, and puffins. All are heavy-bodied, web-footed, short-tailed, and rather short-winged sea birds which use their wings in underwater swimming. All but the Great Auk fly well.

Auks generally bear a striking likeness to penguins. One can say that Auks in northern oceans are the ecological equivalent of the penguins of southern oceans. However, all auks, even the Great Auks, have well-developed wing quills which penguins all lack.

The Great Auk is the finest, most specialized, of the auks, notable for its flightlessness. Presumably it spent most of the year swimming, diving, and living on fish. It was tame and gullible. Fishermen were reported to have captured birds by holding out a fish to a swimming bird and enticing it to the edge of a boat so that it could be stunned with a blow of an oar. Birds captured alive were said to have survived for as long as 4 months and were fed, among other things, potatoes mashed in milk.

Only at nesting times did the birds come on land, on rocky off-shore islands, to lay their single egg. In winter the black of the underside of the head was replaced by white feathers, and young birds were like the winter adults.

John James Audubon's painting of Great Auks for his "Birds of America." Audubon purchased a Great Auk specimen in London sometime before 1836 and used it in this painting. The bird later belonged to Vassar College and is now housed in the Royal Ontario Museum, Toronto.

The Great Auk was a victim of its specialization. Living most of its life in the water, where it swam with its wings as do its relatives, the Great Auk evolved flightless. Coming ashore only on isolated islands where there were no four-footed predators such as foxes, it developed a remarkable tameness and docility. No doubt it thrived in the mid-latitudes of the North Atlantic where the relatively shallow, fish-rich waters provided its food, until man arrived. Not modern man, but Stone Age man brought the first discordant note into its elysium. From the remains in stone-age middens of north-western Europe and Indian middens from New Brunswick to Cape Cod, we know that early man found it breeding

on many off-shore islands. At least occasionally, the Great Auk visited Gibraltar where its bones were found in a cave along with those of Neanderthal man. There is evidence also, that it visited eastern Florida, where its bones have been found in Indian mounds.

By historical times the Great Auk's breeding range had been reduced to three locations. One of these was Geirfugl-asker rocks, off Iceland. This colony vanished in 1830 with the island itself due to volcanic activity. Presumably, the birds transferred to Eldey Rock nearby, where the birds continued to come until June 3, 1844, when the last known individual was killed. The third locality was Funk Island, off Newfoundland. Here the birds existed in such numbers that the sailing directions of the early 1700's gave the presence of Great Auks as one of the surest evidence of the location of the Grand Banks where fishermen came for cod. These fishermen found Great Auks a welcome source of food, and killed them in large numbers.

In 1940 the species was known from but 80 collected specimens, plus some eggs and bones. But even these mute remnants of the species, even these were not safe, for during the air raids over Germany in World War II, two specimens, one in Mainz and one in Dresden, were bombed out of existence. There was no haven for even a dead Great Auk.

The attitude of early man toward animals was militant and utilitarian. Subsequent periods added commercialism. This is well illustrated by one of the historians of the Great Auk, S. Grieve, writing in 1885, "yet the bird, whilst disappearing has in so far helped to the attainment of a higher object . . . the prosecution of fishing on the banks of Newfoundland."

Although it is generally agreed now that the last Great Auk died in 1844, English naturalists continued to search for the auk for several decades, and Alfred Newton, writing in 1861, said he believed a few still existed. However, the nearest he came to first hand evidence when he was in Iceland in 1858 was as follows: An old man named Erlendur Gudmundsson showed him the gun with which he shot a Great Auk in 1809. Reports, all suspect, dwindled and disappeared by mid-century. However, in the late 1930's circumstantial accounts of sightings of Great Auks in the Loften Islands were so convincing that an English naturalist investigated and found that they were based on introduced King Penguins. In 1936 the Norwegians had introduced 9 birds, 2 of which survived until 1944.

The Great Auk has joined the ranks of some 45 bird species (and another 43 subspecies) that have become extinct within the last 300 years, as summarized by J. C. Greenway in his book, *Extinct and Vanishing Birds*. It is significant that 41 of these 45 species lived on islands, and that of 12 more species probably extinct, all were island birds.

Not a single species is known to have become extinct in this period in continental Europe, Africa or South America. In North America there are two species (Carolina Parakeet and Passenger Pigeon;) in Asia, one (Crested Shelldrake); and in Australia, one (Scrub-bird).

Island birds, living only on islands, or living in the sea and nesting only on islands, seem particularly vulnerable to the forces of extinction.

But what are those forces of extinction? In some cases, the factors that killed the last individual specimen of a species are known. The killing of the last Great Auk was by a man on June 3, 1844 as mentioned above. The Stephen Island Wren was discovered and exterminated by a lighthouse keeper's cat in 1894 and the last Passenger Pigeon died of old age in a zoo in 1914.

In other cases the introduction of cats, rabbits. goats, mongooses or pigs is thought to have wiped out species, or the converting of the natural landscape to cultivated fields has eliminated a species habitat, and with it, the species. Greenway gives a chart showing the general inverse relationship in the West Indies between the number of acres forested on an island and the number of species of birds that have become extinct there. The fewer forested acres the more birds that have disappeared.

But no hard and fast rules will explain all cases. It seems that if we must generalize, the most valid generalization is that certain birds and other animal species are incompatible with the changed environment wrought by man. Imagine what it would be like to have herds of buffalo roaming the wheat and corn fields of the Midwest, or wolves and grizzly bears prowling about through the suburbs of Chicago. To be sure of saving many species it will be necessary to establish preserves.

Island species seem especially vulnerable. Examples from the 41 species mentioned above that come to mind are the Dodo of Mauritius, 10 species of honey creepers of the Hawaiian Islands, a sandpiper of Tahiti, a macaw of Cuba, and a kingfisher of the Riu Kiu Islands. Such birds live on islands where the fauna is impoverished, competitors are few, and predators are scarce. In this splendid isolation they develop no tolerance for changed conditions. It is probably no accident that the world's largest living turtles evolved on islands like those of the Galapagos, where they were isolated. They have no adaptability to survive when overtaken by change. The very isolation that produced them was their undoing when change came.

About 1900 Alfred Newton wrote, "As on the death of an ancient hero myths gathered around his memory as quickly as clouds around the setting sun, so have stories, probable as well as impossible, accumulated over the true history of the species." This of course is material for a gifted writer to weave into tales, either with or without a moral. One lesson from the Great Auk's history was drawn by the late Will Cuppy in his collection *How to Become Extinct:* "Under conditions prevailing in the civilized world, any bird that can't make a quick getaway is doomed, and more so if it is good to eat, if its feathers are fine for cushions, and if it makes excellent bait for Codfish when chopped into gobbets. Such a bird, to remain in the picture, must drop everything else and develop its wing muscles to the very limit. It does seem as though that should be clear even to an Auk."

For those who would read more of the Great Auk, I suggest pages 271 to 294 of *Extinct and Vanishing Birds of the World* by J. C. Greenway, and for a dramatization, the first part of the Signet book, *The Great Auk* by A. W. Meckert.

The Museum's Spring 1967 series of film lectures again offers nine exciting programs on Saturday afternoons starting March 4th. This spring's series, open to adults and the children of Museum Members and their guests, is the 127th in the biannual series. The programs are held in the James Simpson Theatre at 2:30; seats are held for members until 2:25, after which adult non-members are seated. Any seats remaining open after 2:30 may be used by high-school students.

127th FILM-LECTURE SERIES

March 4 *Laurel Reynolds*

THE WORLD AT YOUR DOOR

EXQUISITE COLOR FILMING of the interesting bits of natural history found close at hand. From time-lapse sequences of flowers unfolding to the taming of a lizard, Mrs. Reynolds covers a wealth of delightful subjects of the out-of-doors, with pictures and stimulating commentary.

March 11 *Maynard Malcolm Miller*

THE MOUNT KENNEDY EXPEDITION

DR. MILLER, NOTED RESEARCH geologist at the University of Michigan, served as deputy project leader of the expedition to survey the Mt. Hubbard–Mt. Kennedy Massif in the St. Elias Mountains of Alaska, which was sponsored by the National Geographic Society in cooperation with the Boston Museum of Science. This film of the exciting storms, helicopter flights, and surveying activities set in the magnificent mountain wilderness up to almost 14,000 feet above sea-level, is his record of the expedition. It includes a short sequence on the climb itself, in which Sen. R. F. Kennedy took part.

March 18 *Cleveland P. Grant*

AFRICAN ELEPHANT

THE STORY OF A FIVE-MONTH one-man safari to study and film the natural behavior of lions and elephants. In his own camera-safari car Mr. Grant traveled and filmed in South West Africa, South Africa, Rhodesia and Mozambique. He shows exciting color footage of the wildlife of the Kalahari desert: zebra, kudu, springbok, gemsbok, giraffe, various eagles, ostriches and other birds. The film's highpoint is its coverage of hundreds of elephants of all ages, engaged in all their natural pursuits. A spectacular close-up sequence of a pride of lions closes the film.

March 25 *Ed Lark*

ISRAEL

A FILM OF CONTRASTS—the ancient with the modern, the barren with the fertile, the hostile with the peaceful—because Israel is a land of contrasts. The perceptive camera takes us to all the sites of religious significance, ancient and modern, and to the bustling evidences of the emerging industrial society. From busy modern Haifa, to ancient Beersheba, this film shows us the old beside the new. We see bedouins ride their camels past modern housing developments on their way to the market place. Nazareth, the home of Jesus, changed little through the centuries, is shown; as well as King Solomon's Mines, in operation again after 3,000 years.

April 1 *Lewis Cotlow*

THE AMAZON

THIS COLOR DOCUMENTARY of the people and creatures of the Amazon valley delves into the mysteries of the all but impassable rain forest. The areas inhabited by various extremely primitive tribes were reached by traveling 1300 miles up the river by wood-burning boat and dugout canoe, with exciting nature footage all the way. Sequences filmed in the tribal villages themselves show curious customs, exotic methods of hunting, fishing, fighting.

April 8 *Edgar T. Jones*

ARCTIC CANADA

BUSH FLYING IN THE REMOTE regions of the northland forms the exciting backdrop for this film of arctic wildlife, featuring the famous reindeer roundup at Kidluit Bay, a complete Eskimo whale hunt, and sports fishing in arctic lakes. The film also deals with the economies of the North Country, and family life among the eskimos.

—SPRING, 1967

April 15 *Kenneth Richter*

IMAGE OF GREECE

GREECE, WHOSE PAST is the past of the entire Western world, retains its ties with antiquity through monuments and traditions. This perceptive film takes us to the places of the ancient glories, and tells something of what happened where. The camera calls at the Palace of Minos at Knossos, the temple to Apollo at Delphi, the Acropolis and the Parthenon. Among the great cities it films, are Corinth, Sparta, and Salonika. Yet it also shows the here and now of Modern Greece—big industry, contemporary education and modern agriculture.

April 22 *Walter Breckenridge*

THE MYSTERIES OF BIRD MIGRATION

DR. BRECKENRIDGE, DIRECTOR of the Minnesota Museum of Natural History, presents this superb color documentary covering a wealth of bird species, and various types of migration. He also deals with anatomy and feather structure, and surveys current research into unsolved problems of migration.

April 29 *Fran William Hall*

TRAILER 'ROUND THE WORLD

THIS COLOR FILM RECORD of the longest trailer trip ever made is filled with thrills and fun, accidents and heartaches. The roughest part for the 45-trailer caravan was the drive from Singapore to Lisbon. The group ranged in age from 1 to 75, and ranged in space over 34,725 miles in 32 countries, spending a year and a half on the round-the-world trip. They took with them everything from their own doctor to the kitchen sink; their adventures included everything from being guests of the King of Nepal at a rare Sacred String Ceremony to struggling across the "Desert of Death" in Afghanistan.

18th CENTURY BOOK OF SHELLS

THE LIBRARY HAS recently acquired a fine copy of William Huddesford's edition of Martin Lister's *Historia Conchyliorum*, published at Oxford, England, in 1770. The first edition of this celebrated work, a copy of which is in our collections, was issued in parts between 1685 and 1692. It consisted of over 1,000 plates with one or more figures per plate, depicting all the land, fresh-water and marine shells, both recent and fossil, then known. There was no text as such, but some descriptions and indications of locality were engraved on the plates. There was no index.

Huddesford's edition is essentially a reprint of this, expanded to include additional plates, 6 pages of notes from Lister's manuscripts, and two indexes in Latin and English giving the Linnean names for many of the species illustrated.

Lister (1638?–1712), an English physician and naturalist, has been cited as the first to approach the study of mollusks in a scientific way. The arrangement of the plates in the *Historia Conchyliorum* was, to some extent, derived from his studies of molluscan anatomy and was not haphazard. S. Peter Dance, in his *Shell Collecting*; *An Illustrated History* (London, 1966), notes that, "Despite his extremely artificial system, Lister was far ahead of his time in segregating species into apparently discrete groups." Lister had intended to follow the publication of the plates with anatomical descriptions of each of these groups but did not complete the work.

Because it was so much used by the systematists and collectors of the eighteenth and early nineteenth centuries, including Linnaeus, the *Historia Conchyliorum*, even in its incomplete state, still holds an important place in molluscan literature.

—W. Peyton Fawcett, Associate Librarian

NSF GRANT FOR MAZON CREEK RESEARCH

A two-year grant in support of systematic and paleoccological studies of fossils from the Mazon Creek area of northern Illinois has been awarded Eugene S. Richardson, Jr., Curator of Fossil Invertebrates at Field Museum and Ralph G. Johnson, Museum Research Associate and Associate Professor at the University of Chicago. They will continue their study of more than 50,000 specimens, with intensive study of about 125 undescribed species.

The results of this investigation of Middle-Pennsylvanian marine fauna will be published in Volume 12 of *Fieldiana*: *Geology*, which has been set aside for papers on Mazon Creek fossils; the completed work will present in one volume the fauna of the area and period as a whole. The Mazon Creek area with the adjoining strip mines is one of the world's great fossil-bearing localities. For more than a century, amateur collectors and professional paleontologists have worked together to bring to light the rich fauna of the coal-swamp forests of 250 million years ago. This research will continue the work and carry it into the shallow offshore marine waters.

NEW BOOK TO AID TROPICAL MEDICINE

"Ectoparasites of Panama," an 860-page book produced by some twenty scientific collaborators under the sponsorship of the United States Army and Field Museum, has been published by Field Museum Press. The massive work, which contains descriptions, identification keys and environmental studies of hundreds of species of fleas, parasitic flies, chiggers, mites, ticks, and other blood-sucking insects will be of enormous help in controlling diseases which affect millions of people in the tropics. Dr. Rupert Wenzel, Curator of Insects and co-editor of the book points out, "Only with this kind of information in hand can the public health worker determine which insect is responsible for a disease and how to eliminate it."

Lieutenant Colonel Vernon J. Tipton, U. S. Army Medical Service Corps, is co-editor of the book, and co-ordinated the field efforts of the Army, the Middle American Research Unit of the National Institutes of Health, the Gorgas Memorial Laboratory, and other research institutions. This field work, one of the most intensive ever undertaken in Central America, provided most of the study material for the book. Field Museum's part in this major undertaking continues its historic interest in the natural history of Latin America.

CALENDAR OF EVENTS

Museum open during February from 9 a.m. until 4 p.m. weekdays, until 5 p.m. on weekends.

through February 28 Winter Journey: Who's Who in the Prehistoric Zoo?

through February 28 Exhibit: The Great Auk
In Stanley Field Hall; see story on page 10.

through February 21 Photo Exhibit: 22nd Chicago International Exhibition of Nature Photography. In Hall 9 Gallery.

February 28 Concert: Indiana University Baroque Chamber Players
The third in the Chicago Showcase of Music Series, presented by the Indiana University School of Music. At 8:15 p.m. in James Simpson Theatre.

March 1–31 Exhibit: The Third Annual Chicago Shell Club Show.

March 4 Movie: The World at Your Door, by Laurel Reynolds.

March 11 Movie: The Mount Kennedy Expedition, by Maynard Malcolm Miller
The above two events are part of the Spring Lecture Series, described on page 14.

March 12 Movie: Northwest to Alaska, by Walter H. Berlet.
Shows the great wildfowl breeding grounds of the arctic northwest. It is presented by Illinois Audubon Society. At 2:30 p.m. in James Simpson Theatre.

MEETINGS
Open to club members and interested non-members.

Illinois Orchid Society, February 19 at 2 p.m.
Illinois Audubon Society, March 1 at 7:30 p.m.
Chicago Shell Club, March 12 at 2 p.m.
Chicago Nature Camera Club, March 14 at 7:45 p.m.
Illinois Orchid Society, March 19 at 2 p.m.

EXHIBIT LAB FUNDED BY McCORMICK TRUST

Field Museum has been given $300,000 by the trustees of the Robert R. McCormick Charitable Trust. This is the largest gift given by the McCormick Trust in 1966. The funds will be used to create a modern, centralized, exhibit preparation laboratory at the Museum, for the recently formed Department of Exhibition.

Museum President James L. Palmer, in announcing the gift, said, "Although the Museum's exhibits are among the most extensive in the world and in some areas the finest, much revision must be done to make our exhibits contemporary in terms of scientific content, modern exhibition technique, and contemporary design and decor. It will be most difficult to undertake any significant program until such a laboratory is created."

The preparation laboratory will provide studio and laboratory space for the Department of Exhibition's artists, designers, technicians and preparators. A museum-wide coordinated program of exhibition which is now being developed will be executed in the lab. Old exhibits will be renovated, new ones designed and built, and new techniques and materials for exhibition will be tested and developed.

The Department of Exhibition, under Chief Curator Emeritus John R. Millar, was formed in March of last year. It establishes a centralized control over the Museum's preparation of exhibits. Formerly, each scientific department was responsible for its own exhibits. The department is composed of 12 artists and technicians. Each exhibit in the museum is a one-time-only project, using many different materials and methods, and each represents many months of skilled, painstaking work by the members of the Department.

FIELD MUSEUM
OF NATURAL HISTORY
ROOSEVELT ROAD AT LAKE SHORE DRIVE
CHICAGO, ILLINOIS 60605 A.C. 312, 922-9410
FOUNDED BY MARSHALL FIELD, 1893
E. Leland Webber, Director
BULLETIN
Edward G. Nash, Managing Editor
Bea Paul, Associate Editor, graphics

PRINTED BY FIELD MUSEUM PRESS

BULLETIN **FIELD MUSEUM OF NATURAL HISTORY**

Volume 38, Number 3 March, 1967

SPRING JOURNEY-ON AFRICA, DRAWS ON YOUTHFUL TALENT

By Judith Phelps Little, Raymond Foundation

UP MANY STEPS, INTO VAST white space, speed to giant blackened, battling elephants, then grinning victorious Gorgosaurus, then where? Mummies! Some interest in sea mammals along the way; at last the mummies. Wonder why they were made? What kind of people were they? What are the pictures and picture-writings on their mummy cases? Unanswered questions from the natural curiosity of a child faced with things strange—what a fertile field for the educator.

The selection, organization and presentation of a museum's collections try to sow this field meaningfully. Some questions are answered in labels; exhibitions often present ideas as well as objects, the composition of their materials illustrating a principle or telling a story. In addition, however, presentation to children needs special consideration. This is the particular concern of one of the Museum's educational divisions—Raymond Foundation.

Raymond Foundation's Museum Journey program is one approach to the problem. It is designed for children in the Museum, alone, with friends, or with families. The Journey itinerary, singling out one subject or theme, and new every quarter, can be picked up by any Museum visitor. Here are questions, many like those the child would ask himself, which he must answer, in writing, by looking at the objects in the cases and reading labels, some prepared especially for him. When he finishes, he has followed a logically developed theme in which selected important points have been made. His head is not just a jumble of "I wonder"s. He knows, for example, the traveling, hunting ways of the American Plains Indians or how animals prepare themselves for winter.

This kind of concentration, in a vast museum like ours, is good, and the Journey Program has been enjoyed by many in its twelve years. In fact, this year's Spring Journey will concentrate further, increasing in depth an understanding of its subject. The subject, African sculpture, merits this. Time is required to comprehend or even enjoy a work of art, particularly that of a strange culture.

The traveler on this Journey will *draw* his subjects, African figures and masks in the Hall of Primitive Art. He will learn in this way to see the complex forms, and their articulation, of the African sculptor. Certainly he will also be excited by the bold expressions of the faces he meets.

To test this idea, a few fourth graders visiting the Museum with their class were given crayon and paper and asked to draw some figures they liked. They were encouraged, but not coached. The three drawings on this page represent their work. They were done by Donald Peterson (top), Susan Seibert (middle) and Vincent Zarlenga (bottom), of the Jefferson School in Niles, Illinois. It is hoped that our young Journeying artists this spring will enjoy this experience and discover a new pleasure in the Museum.

Guatemala Birds:
Random Recollections of an Ornithologist

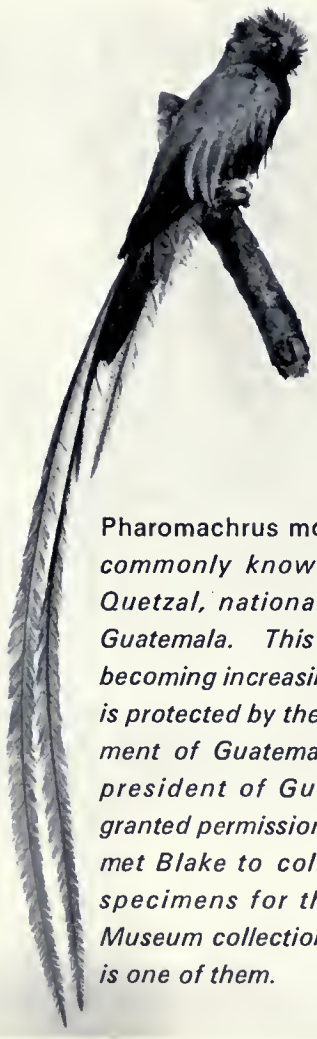
BY EMMET R. BLAKE, CURATOR, BIRDS

From its earliest years much of Field Museum's interest has centered in the nations of tropical America. Museum expeditions seeking specimens and data have scoured the length and breadth of the southern continent. Few regions, however remote, have been overlooked by our curators and subsidized collectors.

Today, almost seventy-five years after its founding, the Museum's tropical American collections bulge with millions of specimens and are conceded to be among the finest in the world. This material has been put to good use in scores of published books and several thousand technical reports of interest to specialists in many fields.

Of the Central American countries, Guatemala has perhaps received the most attention, especially from the Departments of Botany and Zoology. Field work in Guatemala was begun by the Division of Birds as early as 1904. Its interest in the country's remarkably diverse avifauna has never since abated. And small wonder. Although scarcely the size of New York State, Guatemala boasts some 800 kinds of birds, including a number that are endemic or rare.

The exceptional wealth of bird life is due to several favorable factors. Most important are the antiquity of Guatemala's geological history and the high degree of volcanic activity that has given rise to a remarkably complex topography and several distinct climates, these often replacing each other very abruptly. Periods of long isolation, whether geographical or topographical, favor the evolution of distinct forms. These may in turn be modified by the invasion of still other forms when isolation has ended. Important also is the country's location, which favors the presence of both northern and tropical species.



Pharomachrus mocinno—*commonly known as the Quetzal, national bird of Guatemala. This species, becoming increasingly rare, is protected by the government of Guatemala. The president of Guatemala granted permission for Emmet Blake to collect two specimens for the Field Museum collections. This is one of them.*

Three major life zones, each with its characteristic plant and animal life, are represented in Guatemala. The Tropical Zone extends from sea-level to altitudes of 3,000–4,000 feet, the Subtropical Zone from 4,000–6,000 feet (much higher in places), and the Temperate Zone from 5,000–13,000 feet. Several subdivisions, based largely on humidity and soil, increase the diversity of habitat that is essential for so varied a bird fauna. Lists of the representative species of each would serve no useful purpose in the present context. Sufficient to say that wherever one travels in Guatemala, he will find birds in abundance and in enough varaiety to stound and please even the most blasé tourist from the North.

Those who visit the country in fall or winter can expect an additional bonus in the presence of scores of northern migrants seemingly quite at home in tropical surroundings. Many, especially among the warblers, tanagers, and orioles, may be seen for the first time in their subdued and not easily recognized winter plumage. The first glimpse of a wood thrush, catbird or perhaps a Baltimore oriole feeding unconcernedly in company with toucans, trogons, motmots or other tropical birds may jolt one into questioning his sobriety.

Of all the tropical countries I've visited in the interest of ornithology over a period of thirty years, Guatemala remains my first love. Besides ornitholog-

---

Field Museum's Guatemala Tour—There are still a very few reservations open for Field Museum's Guatemala Tour, October 27–November 12, 1967. Reported in full in last month's Bulletin, the tour will be limited to 60 persons, in two separate groups, each of which will be accompanied by members of the Museum's scientific staff. For reservations and information, write Guatemala Tour, Field Museum, Roosevelt Road at Lake Shore Drive, Chicago, Illinois, 60605. Tour price (all expense) is $1260, including $400 tax-deductible donation to Field Museum.

ical reasons, there are the more general ones of easy access from the United States by air, sea or highway; the superb climate—never too cold and seldom excessively hot; the diverse and magnificent scenery; the numeros pre-Columbian and colonial ruins, silent reminders of long-past periods of grandeur; the colorful clothing and weaving of the rural population, descendents of the once lordly Mayas.

MY MEMORIES of the "Land of Eternal Spring" date back to 1934. At that time the Museum commissioned me to make a representative collection of birds and also to collect both plant and animal specimens for three exhibits of distinctive natural habitats and their associated bird life (now in Hall 20). First on my agenda was material for an exhibit showing a segment of tropical rain forest, specifically the forest crown and its characteristic birds.

Most tropical species are non-migratory but at certain seasons many range widely in search of trees with ripening fruit. In the course of a day such a tree may be visited by a hundred or more birds of several families and many species. An isolated fruiting tree is usually the scene of frantic avian activity from dawn until dusk and there are few better sites for observing—or collecting—a diverse assemblage of birds. All of the material needed for one of my assignments, a Caribbean lowland forest group, was packed for shipment to Chicago within ten days after setting up my first camp near Puerto Barrios. Two species of toucan, the keel-billed and collared aracari, are featured in the exhibit. Several other tropical birds and a wintering wood thrush are also shown in it.

Caciques and oropendulas, colonial-nesting relatives of blackbirds, meadowlarks and orioles, are characteristic of tropical America. One of the largest and most spectacular species is Montezuma oropendula, a crow-sized oriole, mainly chestnut in color with a bright yellow tail. Their pendant nests, 3–5 feet deep, are woven of grass and are usually attached to the top-most branches of large trees. At a distance they resemble elongated gourds. A colony may include a hundred or more closely-spaced nests and often is associated with wasp nests, evidently for protection. Filling the Museum's order for a typical nesting colony of oropendulas obviously presented problems of some magnitude.

My companion in this venture was the late Karl P. Schmidt, Curator of Reptiles (later Chief Curator of Zoology), a born naturalist and indefatigable collector. His presence reassured me, and in due course we located a suitable colony in the crown of an enormous ceiba tree. But there were complications. The trunk was a good five feet in diameter and its base heavily buttressed and quite impossible to scale. Worse yet, several swarming wasp nests were scattered among the upper branches. I was dismayed but Karl dismissed my qualms with a disdainful "duck soup." We pondered the situation and agreed on a stratagem.

Hours before dawn next day, we arrived at the tree with ax and lantern. As chief of mission and much my senior in the Museum hierarchy Karl demanded, and was quickly granted, the honor of drawing "first blood." I smote mosquitoes, gave moral support, and held the lantern. It was strenuous work. Karl, stripped to the waist, set to with a right good will. As time passed and per-

Field Museum habitat group showing nesting colony of Montezuma oropendulas. In Hall 20.

spiration poured, I applauded his efforts and praised his axmanship, the vigor and accuracy of his stroke, the size of the chips and, especially, the stamina of so mature a man of science. But beware the young ornithologist of vacuous mien! His guile may be that of the fox, and his deviousness that of the serpent.

In due course the tree crashed to the ground, and with it a tangle of 127 nests in various stages of completion. As egg-laying had scarcely begun, the destruction was not lasting. Breeding oropendulas quickly rebuild their colonies and, in any case, spend much of their time attempting to dismantle unguarded nests of their neighbors. The retrieval of nests and the preservation of plant ac-

Rare horned guan, Oreophasis derbianus.

cessories needed for the Museum's exhibit took several days, for work was often interrupted by attacking wasps.

A TRIP OVER the Pan-American highway of Guatemala will amply reward anyone who has an interest in birds. The Pacific slope is much drier and less heavily forested than the Caribbean, and its avifauna consequently strikingly different. Although some species are common to both regions, even these usually are represented by distinct geographical races or varieties. Many birds of the Pacific littoral have no close relative in the wet forests of the other coast, and faunally the two areas are different worlds.

Even more arresting than either is the bird life of the arid interior valleys, as that of the upper Motagua River. The region is essentially a desert, which has a quite distinctive flora and fauna both as to species and genera. Although remote from either coast it is easily accessible to tourists. The village of Salamá was for a time my base of operations while collecting desert birds. The region abounds with quail, terrestrial cuckoos, motmots, desert woodpeckers and wrens of several species, flycatchers and gaudy orioles.

Collecting here began at earliest dawn and usually before the heat of noon there were enough specimens to keep one busy at the skinning table until late at night. As my collection grew, it became necessary to travel farther each day, and finally to the distant pine-clad mountains. This called for earlier and earlier departures and better transportation. For a time I depended on a reluctant mule of scant ambition, but ultimately I rented a weary bicycle on which I labored as much as fifteen miles. Each way, that is. After three decades, I remember not so much the strenuous field work and bountiful bird life as the debacle on my final day afield. While speeding down a footpath that seemed needlessly circuitous I impetuously tried a shortcut across the desert. Cactus grew in abundance and I quickly gained new respect for that desert weed and what it can do to bicycle tires and human skin.

Many technical papers and even book-length reports about birds that occur in Guatemala have been published. One species, of which very little is known, is especially noteworthy by reason of its rarity and remarkably restricted range.

The Giant Grebe numbers fewer than 200 individuals and is found only on Lake Atitlan, a relatively small body of water that nestles between symmetrical volcanoes. A place of spectacular beauty, Lake Atitlan is a focal point for most visitors to Guatemala.

Visiting bird lovers who yearn for a red letter day or an enviable conversation piece that will serve for decades should be alert to any Pied-billed Grebe of unusual appearance. Large size, heavy bill and, especially, a black head and neck are its hallmarks.

LAST AND MOST important item on the Museum's agenda was the quetzal, Guatemala's national bird and the most spectacular member of the pan-tropic trogon family. This fabled species, scarcely the size of a pigeon, was revered by the pre-Columbian Indians who invested it with special religious significance. Male quetzals are bright green above, deep crimson below and have a distinctive helmet-like crest. Filmy plumes of the rump may extend almost three feet beyond the white tail, adding much to the bird's distinctive beauty. The female, lacking the crest and elongated plumes, is relatively drab.

Quetzals live in humid forests at medium altitudes, from southern Mexico to western Panama. Tree ferns and epiphytes are conspicuous elements of this "cloud forest" flora. Llianas lace the trees, and the trees, like the ground below, are often covered with deep, spongy moss. In recent years much of this distinctive habitat has been destroyed by man. But here and there undisturbed plots remain, sheltering the diminishing populations of quetzals, horned guans and other unique birds that cannot survive the loss, or even modification of their habitat.

Few persons today are privileged to see quetzals in their natural surroundings. However, visitors to the Museum will find in Hall 20 a carefully reconstructed segment of a Guatemala "cloud forest," together with a pair of birds mounted as they appeared in life above my camp on the slopes of Volcán de Tajumulco.

Note: The following bird guides, available in the Museum's Book Shop, are recommended for Guatemala.

Blake, Emmet R. *Birds of Mexico: a guide for field identification.* University of Chicago Press, 1953. $8.50. Although written for Mexico, this fieldguide includes the descriptions of virtually all Guatemala birds.

Smithe, Frank B. *The Birds of Tikal.* American Museum of Natural History, 1966. $7.50.

NATURE PHOTOGRAPHY EXHIBITION—22ND YEAR

We show here a small sampling of the more than 125 prints just exhibited at the Museum in the Annual Nature Photo Show. For twenty-two years the Chicago Nature Camera Club has culled the best from thousands of entries from all over the world, with the aid of distinguished juries of naturalists and photographers. This year's jury panel was made up of Hymen Marx, Associate Curator of Reptiles and Amphibians, Field Museum; Dr. John Clarke, Associate Curator of Sedimentary Petrology also at the Museum; Dr. Frank E. Rice, Fellow of the Photographic Society of America; Grace H. Lanctot, photography instructor and nature lecturer; and Thomas M. Iverson, General Foreman of Floriculture, Garfield Park Conservatory.

One of the judges, Dr. Clarke, had these comments on the wealth of material he was called on to evaluate: "This was my first experience as a judge for this show, and I was impressed with the large number of exceedingly well-taken photographs. It seemed to me that the methods of the club in registering judges' selections were the most objective possible under the circumstances. Each of the five judges rated each picture independently with no knowlege of how the others were voting. Then those photographs with the highest scores were discussed, and another independent vote was taken. In some cases three or four votings were required to choose a winner. Although no one of us agreed with all of the final selections, by and large the selections represented a consensus. Our main standards were photographic quality, artistic composition, and representation of nature, not necessarily in that order. I must emphasize how difficult it was to choose from more than 3,200 slides and about 420 prints; it was exceedingly hard work, but I think I can speak for all of us in saying that we enjoyed it, and the club treated us so graciously that it was a pleasure to do."

The Chicago Nature Camera Club was

1

2

3

4

5

6

organized in 1944, the first organization of its kind in the United States. In 1943, Field Museum itself sponsored what is probably the forerunner of this annual event, a show called "Lenses on Nature," as part of its 50th Anniversary Celebration. The following year Hubert J. Johnson, an Associate of the Photographic Society of America, organized the Nature Camera Club of Chicago, which from the beginning was affiliated with the Photographic Society of America. The new organization undertook the organization of the first Chicago International Exhibition of Nature photography, since then held annually at Field Museum.

In addition to the prints, both black and white and color, some 800 slides are selected each year and are presented at two successive weekend afternoon slide shows in the Museum's James Simpson Theatre. Through the years this show has earned the reputation of being the largest show of its kind in the world, and of providing the best service to prospective exhibitors in the handling of slides and prints submitted. The club welcomes entries from photographers all over the world.

An affiliate of the Chicago Area Camera Clubs Association, the club also welcomes interested visitors at its monthly meetings held in the 2nd floor Meeting Room at Field Museum on the second Tuesday of each month at 7:45 p.m.

1 "RAUPE" - FRANZ DUTZLER, EFIAP, HONORARY DCP/LINZ, AUSTRIA

2 "CHANGE OF SEASONS" - JAMES A. McGILL/VALPARAISO, INDIANA

3 "QUEEN OF THE NIGHT" - AGNES M. HOLST/PHOENIX, ARIZONA

4 "POOKIE, NIGHT APE, GALAGO"
- WILLIAM J. CURRY/LONG BEACH, CALIFORNIA

5 "FROSCH AKROBAT" - LEO VRANA, AFIAP, OGOP/VIENNA, AUSTRIA

6 "SUNSET FLIGHT"
- PAUL D. YARROWS, APSO, ARPS, FKCC/ROCHESTER, NEW YORK

7 HONORABLE MENTION "THE FAMILY"
- WALTER ROSSINI, APSSA/JOHANNESBURG, SOUTH AFRICA

7

CALENDAR OF EVENTS

Museum open from 9 a.m. to 5 p.m. during March and April

March 1–May 31 Spring Journey: Africa: Faces of the Forest and Grassland
A self-guided tour of African cultural exhibits for youngsters. Direction sheets available at information desk and at Museum entrances. See story on page 2.

March 1–31 Exhibit: Third Annual Chicago Shell Show. Stanley Field Hall.

March 11 Film-lecture: Mount Kennedy Expedition, by Maynard M. Miller.

March 12 Film: Northwest to Alaska, by Walter H. Berlet. A film of the great wildfowl breeding grounds, presented by the Illinois Audubon Society.

March 18–April 9 Exhibit: Variations on a Theme. A photographic study of the geometric perfection of the stonecrops, a group of succulent plants. In Hall 29.

March 18 Film: African Elephant, by Cleveland P. Grant.

March 25 Film: Israel, by Ed Lark.

April 1 Film: The Amazon, by Lewis Cotlow.

April 8 Film: Image of Greece, by Kenneth Richter.

All films are shown at 2:30 p.m. in James Simpson Theatre.

April 18 Concert: Indiana University Jazz Ensemble
Free to the public at 8:15 p.m. in James Simpson Theatre.

MEETINGS

Chicago Shell Club, March 12 and April 9 at 2 p.m.
Chicago Nature Camera Club, March 14 and April 11 at 7:45 p.m.
Illinois Orchid Society, March 19 at 2 p.m.
Illinois Audubon Society, April 5 at 7 p.m.

FIRMS CONTRIBUTE TO MUSEUM BUDGET

The Development Committee of Field Museum's Board of Trustees, formed in early 1966, has achieved notable success in its initial program. The Committee, under the Chairmanship of Mr. Harry O. Bercher, President of International Harvester Company, assumed the responsibilities of determining Field Museum's long term needs and planning the means by which to meet these needs.

To secure one segment of necessary annual operating income, solicitation of contributions from Chicago corporations and professional firms was begun. The appeal was the first of its kind since the Museum's founding. More than 100 corporations and businesses responded with contributions, 38 giving one thousand dollars or more. These 38 corporations have been elected Corporate Associates of Field Museum. Firms which each year contribute a thousand dollars or more to the operating budget of the Museum will be honored on a special plaque now being designed for display in Stanley Field Hall.

An increased annual operating income is perhaps the most immediate need of Field Museum. Funds for necessary building maintenance and repair, updated employee benefits, and expanded research, exhibition and educational programs are essential for maintaining Field Museum's position as a great world museum. It is hoped that the excellent response of Chicago business to the present program will stimulate other corporations and individuals to provde additional and essential financial support.

Current Corporate Associates of Field Museum are:

Arthur Andersen & Co.
Appleton Electric Company
Borg-Warner Corporation
Carson Pirie Scott & Co.
Chicago Daily News
Chicago Sun-Times
Chicago Title & Trust Company
Columbia Pipe & Supply Company
Commerce Clearing House, Inc.
A. B. Dick Company
Reuben H. Donnelley Corporation
Draper & Kramer, Inc.
Marshall Field & Company
First National Bank of Chicago
General Biological Supply House, Inc.
W. W. Grainger, Inc.
Harris Trust and Savings Bank
Hart Schaffner & Marx
Illinois Bell Telephone Company
Inland Steel Company
International Harvester Company
Jewel Companies, Inc.
Jupiter Corporation
M. S. Kaplan Company
Kirkland, Ellis, Hodson, Chaffetz & Masters
LaSalle National Bank
Link Belt Company
John Moiir & Sons
Northern Trust Company
Peoples Gas Light and Coke Company
Playboy Magazine
Quaker Oats Company
Rollins Burdick Hunter Co.
G. D. Searle & Co.
Sears Roebuck and Co.
Sunbeam Corporation
Texaco Inc.
Victor Comptometer Corporation

NSF GRANT FOR VIPER RESEARCH BY MARX, RAAB

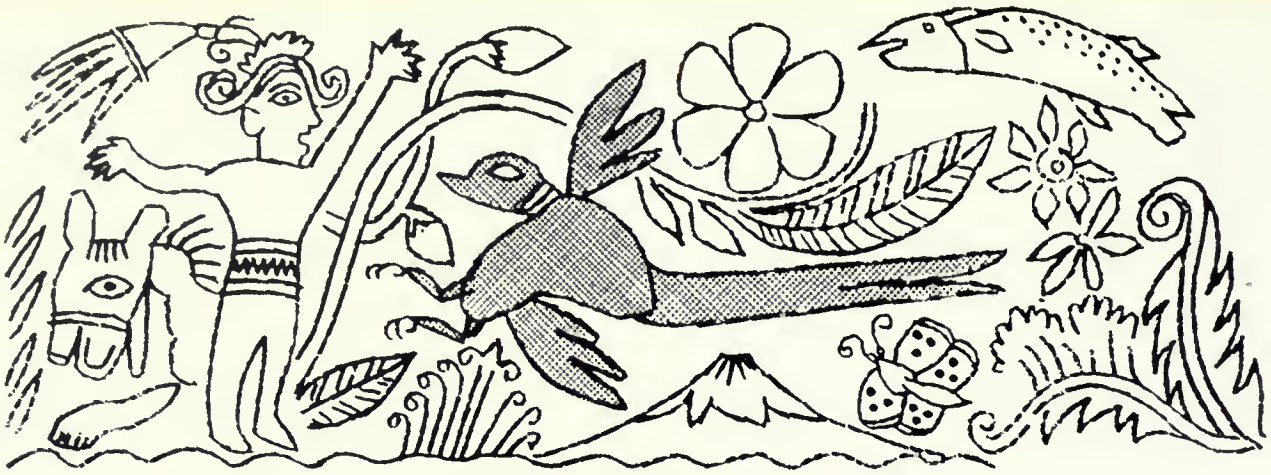
The National Science Foundation has awarded a $27,100 grant to Field Museum for work by Hymen Marx, Associate Curator of Reptiles and Amphibians and George B. Rabb, Museum Research Associate, Division of Reptiles and Amphibians. Mr. Rabb is also Associate Director, Chicago Zoological Society. The grant will support an investigation into the phylogeny (evolutionary history) of the poisonous snakes—the vipers, and into the phylogeny of the characters of advanced snakes. This study is an outgrowth of previous research.

"Kruger Park Derby," *awarded an honorable mention in the 22nd Chicago International Nature Photography Exhibition held last month at the Museum, was taken by* Ludi Blum, APSSA, *of Johannesburg.*

FIELD MUSEUM
OF NATURAL HISTORY
ROOSEVELT ROAD AT LAKE SHORE DRIVE
CHICAGO, ILLINOIS 60605 A.C. 312, 922-9410
FOUNDED BY MARSHALL FIELD, 1893
E. Leland Webber, Director
BULLETIN
Edward G. Nash, Managing Editor
Bea Paul, Associate Editor, graphics

PRINTED BY FIELD MUSEUM PRESS

BULLETIN FIELD MUSEUM OF NATURAL HISTORY
Volume 38, Number 4 April, 1967



MEMBERS' NIGHT FRIDAY, MAY 5th, 1967

It will be an evening in Guatemala on Members' Night May 5, when members and their families will also take the traditional look behind the scenes of world-wide Field Museum research.

The evening's events will continue from 6 to 10 o'clock. Research areas will open at 7 and the cafeteria will be open from 6 to 8. Chartered buses, free to members, leave at frequent intervals from Jackson and State Streets to provide convenient transportation.

The Guatemalan theme will be carried out in a self-guided tour of Museum exhibits featuring Guatemalan subjects in anthropology, botany, geology and zoology. The tour as a whole will give the in-museum "tourist" a good look at the little Central American republic with Indians still living lives out of the past and its vividly contrasting mountain highlands and tropical lowlands. Staff members will be posted at many exhibits to comment and answer questions.

A highpoint of the evening will be presentation of a just-published volume in the monumental series, "Flora of Guatemala," by Dr. Louis O. Williams, Chief Curator of Botany, to a representative of the Republic of Guatemala.

Marimba music and Latin American refreshments, including Guatemalan black bean *Boquitos*, *chia* and *jamaica* will be served.

Films on Guatemala and on Maya civilization will be shown. Dr. Louis O. Williams will discuss Guatemalan plants and peoples in an illustrated lecture and Loren P. Woods, Curator of Fishes, will speak and show slides on "Fishing, Farming and Festivals in Guatemala and Southern Mexico."

A special exhibit for Members' Night of Guatemalan contemporary handicrafts will be displayed in Hall Nine, where the Costa Rican gold figures—Central American Indian work done in pre-Spanish times—will also be shown. New acquisitions such as the Great Auk and the chimpanzee paintings will be displayed.

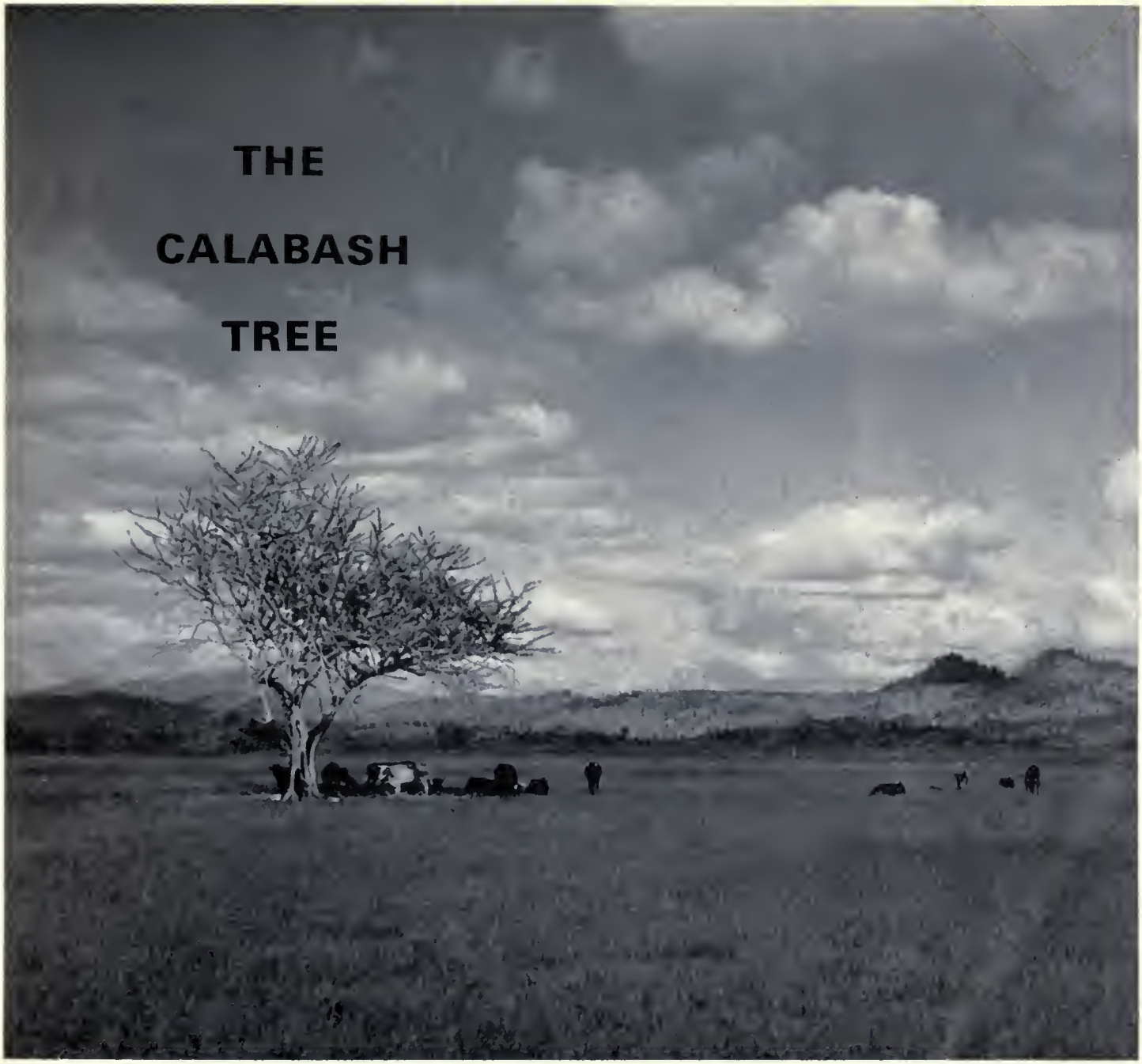
A Guatemalan market stall will be operated by the Botany Department. The Department will also display work from manuscript to finished volumes on the "Flora of Guatemala" and will exhibit herbarium specimens from Guatemala. Evolution and reproduction of plants will be shown in fungi, ferns and flowering plants.

The Department of Anthropology will display Guatemalan Indian textiles, recent acquisitions in African ethnology, and specimens and methods of research on New Ireland art. Dr. Kenneth Starr and Dr. Hoshien Tchen will conduct an East Asian open house, with displays of materials and consultations on Chinese art and archaeology. Mrs. Christine Danziger will demonstrate the treatment of leather and cleaning of wooden specimens in the Robert R. McCormick Conservation Laboratory.

Dr. Emmet R. Blake will preside over a display of Guatemalan birds in the Division of Birds, while in the Mammals Division Guatemalan mammals will be displayed and an exhibit will illustrate the meaning of color in mammals. The Division of Fishes will emphasize the diversity of salt and fresh water fishes in one display, while in another, "Fish Bones from Guam," it will be shown how ichthyologists and anthropologists cooperate. Major types of poisonous snakes from Guatemala will be displayed in the Division of Reptiles and Amphibians.

Synbranchus marmoratus, a Guatemalan eel-like air breathing fish that starts life as a female and ends life as a

Continued on page 8



by Louis O. Williams, Chief Curator, Botany

Crescentia alata HBK. is one of the commonest trees along the Pacific from Mexico to Nicaragua. It occurs also on the Atlantic coast but less commonly, and up into the mountains of Central America to about 3000 feet elevation. The tree has been carried to and is cultivated occasionally in the tropics of the old world. On the arid Pacific plain of Central America from Guatemala to Nicaragua *jícaros* or *morros*, as they are usually known locally, sometimes occur in almost pure stands, especially in level places where the drainage is poor and water is likely to collect and stand during the wet season.

The *jícaros* or *morros* have attracted the attention of European peoples since the time of discovery because of their uses. The leaf has the shape of a cross and has been taken to be of religious significance by many people. In clearing fields or pastures the country people will very often leave the *jícaro* trees, either because of the presumed religious connection or because of the economic value of the tree. The early explorers in Central America thought that the Indians of the region must surely have had knowledge of the cross and its significance because the leaves of this tree were cruciform.

Oviedo y Valdes in his "Historia General de las Indias" (Lib. VIII, Cap. IV, 1535) described both species of Crescentia quite accurately and in fact knew more about them than did Linnaeus more than 200 years later when he supplied one of them with a botanical name. Oviedo marvelled at the

— His Majesty Charles III, King of Spain, issue
Spain and to send a scientific expedition to collect
specimens. Two artists accompanied the expedition,
that one of them prepared the original of the illustrati

The expedition of Sessé and Mociño, the two pr
which they collected finally found their way back to
imagining, were stored away in Madrid and there
Museum in 1935 for study by Paul C. Standley. Int
been shipped from Mexico to Spain some 130 years
studied soon after they were made they would now
than a century most of them had been re-collected a

cross-shaped leaves of the *jícaro* and took some of them back to Spain with him. Oviedo was one of the first to suggest that the Indians could not have been ignorant of the cross because of the evidence of the leaves of the *jícaro*.

The wood of the *jícaros* has been used to make special things. It is not difficult to work when recently cut but as it seasons it becomes as "hard as iron" and is resistant to wear.

Stirrups have been made from the wood of *jícaro* trees in Central America since colonial times and some stirrups, which might be considered *objets d'art*, still exist and occasionally are to be found in use. The wood is still used to make stirrups but the workmanship of most of those now made is very much less skillful than that of those made in the past. This apparent decadence in artisanship applied to stirrups could well be due, in part at least, to the decreasing importance of saddle animals in travel.

Containers for liquids and for foods are made from the durable shell of the fruits of the *jícaro* and from a related species, *Crescentia cujete* L. These cups or containers, often called *guacales* as reported by Oviedo 425 years ago, are commonly used by the country people of Central America and are sold in all markets. Occasionally the surface of the shell is carved with intricate designs and the fruits used for mantlepiece ornaments.

The pulp of the *jícaro* fruit is said to be used as a food but it must not be commonly eaten. I found it usually quite unpalatable. The seeds of the *jícaro*, however, are an ingredient used in preparing a refreshing drink called *horchata*. The seeds are often to be had in village or city markets. Mixed with the seeds of maize they are also fermented to make a kind of beer which is sometimes called *chicha*. This *chicha* was probably one of the kinds of fermented drinks known to the Central American Indians before the conquest.

Cattle eat the contents of the *jícaro* fruits and seem to find them nutricious. Fermentation takes place in the fruits after they fall to the ground and in due course the pulp and seeds dry out. The cattle are said to eat them when they are fermenting and after they have dried out. Forage is usually

al Order on October 27, 1786 to establish a botanical garden in New
ural objects and to make the illustrations necessary to elucidate these
: Dios Vicente de Cerda and Athanasio Echeverría. It may be assumed
ft, of the calabash tree, now in Field Museum's herbarium.
botanists, continued in Mexico from 1788 until 1804. The materials
anical garden in Madrid. These collections, at that time rich beyond
nained for more than 100 years. The specimens were sent to Field
y enough they arrived in Chicago in the same packets in which they had
If the collections of Sessé, Mociño and their companions had been
c to our knowledge of the Mexican flora. Neglected for well more
ibed by other botanists.

Left, shield of Nicaragua among other designs carved on container made from parts of three jícaro fruits.

Center, decoratively carved Spanish Colonial stirrup made from jícaro wood.

Below, the orchid Laelia rubescens *grows abundantly in the branches of a jícaro tree.*

limited along the coastal plain during the dry season, which occasionally is quite severe, so it is not unlikely that cattle would find the fruit acceptable as forage in that season.

The relative abundance of the calabash tree, and of certain kinds of leguminous trees, may be at least partly due to the cattle eating these seeds and some of the seeds passing through the animal still in condition to germinate. I have seen seedlings of the calabash tree, or *jícaro*, and of some leguminous trees emerging from cow dung after the first rains of the wet season. The cow dung supplies the fertilizer which gives the seedlings a greater chance of survival on these sterile coastal plains.

The fruits of the calabash tree are usually oval to nearly round and vary greatly in size. Normally they are some four to six inches long and three to five inches in diameter. Fruits have been reported as much as a foot long. I have not seen any this large and believe that these reports are due to confusion of the fruit of the calabash tree with the calabash gourd.

The small flat and shining seeds may be separated from the pulp, when the fruits are mature, either by drying or first fermenting naturally and then drying. The seeds are found in the markets in this semi-cleaned condition.

A use which may prove of greater importance than any of the present ones may be the utilization of the oil in the seeds. The unhulled seeds are about 35% oil. The oil, which may be extracted by hydrolic pressure and probably in other ways, is a bland and relatively stable edible oil. It may well partially fill the need for edible oils in the region where the tree grows so abundantly. I do not know of the oil being expressed and used in Central America but there does not seem to be any reason why it should not be.

The calabash trees along the coastal plain from Guatemala to Nicaragua are hosts to three kinds of orchids which often occur on them in great abundance. Two of these orchids are species of Oncidium and Epidendrum, and not very conspicuous. The third is *Laelia rubescens* which is quite showy and when in flower gives these attractive *jícaro* trees somewhat the aspect of a peach tree in flower.

Pre-Columbian Isthmian Goldwork

by Donald Collier, Chief Curator, Anthropology

One of the most interesting aspects of pre-Columbian art in the Isthmian region of Central America is the large number of gold ornaments found in graves. When the Spaniards explored Panama and Costa Rica in the sixteenth century, they found the Indians making a variety of metal ornaments. We now know that this metal-working art had been going on in this area for at least a thousand years before the Spanish conquest.

A special exhibition called Aboriginal Metalwork in Lower Central America will be shown in Hall 9 Gallery from April 1 through May 7. This exhibition, which was organized by Doris Stone and Carlos Balser of the National Museum of Costa Rica, contains more than 100 objects illustrating the forms and technology of Costa Rican metal ornaments. These are illustrated and discussed in a catalogue which will be available during the exhibition.

Metal was used in Costa Rica mainly for ornaments, not for tools. Most common were objects of gold, gold-copper alloy (called *tumbaga*), and copper. Many of these ornaments were made with holes or rings for suspension as pendants or parts of necklaces, inter-

spersed with gold or tumbaga beads. Other forms served as breast-plates, ear rings, ear plugs, and miniature bells. These ornaments were in the form of human and animal figures. The favorite animals depicted were the jaguar, deer, monkey, lizard, frog, catfish, and birds. The favorite bird, usually called an eagle by modern collectors, probably represents a vulture.

The three-dimensional ornaments were cast by the lost wax process, which consisted of four basic steps. A figure was modelled in wax and enclosed in a clay mold with venting holes. The mold was then heated to harden the clay and melt out the wax model. While the mold was still hot, molten metal was poured into the cavity vacated by the wax. Hollow casts were made by modeling the wax over a core of clay and charcoal which remained behind when the wax was melted out. This core could be removed after the metal figure was cast, but was sometimes left in place.

Gold was hammered into sheets to be made into ornaments. During this process the gold was heated (annealed) from time to time to overcome the brittleness and cracking that resulted from cold hammering. The gold ornaments were then shaped by hammering and cutting and the designs were made by incising, embossing, chasing, and by cutting out small sections of metal. Sheets of metal and parts of ornaments were joined by welding, soldering, and crimping. Tumbaga ornaments were gilded by the *mise en couleur* process in which the surface copper in the alloy was dissolved by pickling in acid plant juices, which left a higher gold content on the surface.

The steps in casting, and all these other metallurgical techniques and processes are illustrated by specimens in the special exhibition of Costa Rican metalwork.

In spite of the variety and complexity of Isthmian metallurgy and its considerable antiquity, there is clear archaeological evidence that metal working did not originate locally but diffused from South America. The earliest gold working in Peru is from the Chavin culture of 700 B.C., and gold and copper casting were developed in Peru by the time of Christ. Gold working, including lost wax casting, seems to have been developed in Columbia by the first century A.D. Gold working had spread to Panama by the third century, and to Costa Rica by A.D. 500–700.

It is a surprising fact that the great Classic cultures of Mesoamerica, such as the Teotihuacan culture of Mexico and the Maya culture of Yucatan and Guatemala, dating from A.D. 300–900, included no metallurgy. It is curious because to the north the Old Copper Indians of Wisconsin were making copper tools before 2000 B.C. and the later Woodland Indians of the Midwest continued to use copper for tools and ornaments. To the southeast in Panama and Costa Rica, as we have seen, metal working was common by the middle of the Classic period in Mesoamerica. The earliest gold found in a Maya site is a trade piece from Panama at Copan, Honduras, on the southeast border of the Maya area, dating from A.D. 780. Only a few other finds of trade gold have been made in Late Classic Maya cities. Not until the Post-Classic period, after A.D. 1000, does metal working become common in Guatemala and Mexico. And in the centuries before Cortez it was not the Mayas but the Aztecs and the Mixtees who became the great goldsmiths of Mesoamerica.

Far left, lizard, open filigree casting

Left, human effigy in gold alloy

Above, parrot with tail like that of a Cebus monkey

Right, frog with spine markings done in open back casting

The raffish figure on the cover is cataloged simply, "Man with a bottle."

The pieces shown here were selected from the exhibit in Hall 9 Gallery. All measure less than three inches.

CALENDAR OF EVENTS

Museum open from 9 a.m. to 5 p.m. during April, and until 6 p.m. in May.

April 1-May 7 Exhibit: ANCIENT ISTHMIAN METALWORK. Small sculptures, mostly in gold, of monkeys, birds and reptiles, ornaments and ceremonial objects, made by pre-Columbian Indians. From the National Museum of Costa Rica.

through May 31 Spring Journey: AFRICA-FACES OF THE FOREST AND GRASSLAND. A self-guided tour of African cultural exhibits for young people. Direction sheets available at information desk and at Museum entrances.

April 18 Concert: INDIANA UNIVERSITY JAZZ ENSEMBLE. 8:15 p.m. in James Simpson Theatre.

April 15 Film-lecture: IMAGE OF GREECE, by Kenneth Richter.

April 15 MUSEUM TRAVELER DAY. Boys and girls who have successfully completed groups of 4, 8, 12, 16, or 17 Museum Journeys will receive awards at 10:30 a.m. in James Simpson Theatre. Following the presentations the color film, ISLANDS OF THE SEA will be shown; it deals with some of the wild-life seen by Charles Darwin on the voyage of the *Beagle*. All boys and girls are welcome.

April 22 Cub Scout Day Program: MOUNTAINS OF AMERICA, the April theme of the Cub Scouts, will be emphasized in a film presentation at 10:30 a.m. which will show some of the natural history of mountains. All boys and girls are welcome.

April 22 Film-lecture: MYSTERIES OF BIRD MIGRATION, by Walter Breckenridge.

April 29 Camp Fire Girl Day Program: "REAL MOVIES." Films on puppet shadow play tie in with the Camp Fire Girl's theme of creative arts. After the film presentation direction sheets on related Museum exhibits will be made available. Open to all boys and girls at 10:30 in James Simpson Theatre.

April 29 Film-lecture: "TRAILER 'ROUND THE WORLD," by Fran William Hall.

May 5 Members' Night: AN EVENING IN GUATEMALA, see story page 2.

MEETINGS | NATURE CAMERA CLUB OF CHICAGO, April 11 and May 9 at 7:45 p.m.
ILLINOIS ORCHID SOCIETY, April 16 at 2 p.m.

MEMBERS' NIGHT (*Continued from page 2*)

male, will be studied in an exhibit offered by the Division of Vertebrate Anatomy. The special adaptations in the respiratory organs of the fish as they relate to airbreathing will be shown. "The fish is capable of living out of water for long periods," according to Dr. Karel F. Liem, Assistant Curator of Vertebrate Anatomy. "Another interesting feature is that each fish starts out as a female. After two to three years, the fish changes sex and becomes a male."

A species of tiny beetles which includes no males will be the subject of an exhibit in the Division of Insects. "Rats, Bats and Bugs of Panama" will be a display on a book vital to the health of millions in the tropical world, "Ectoparasites of Panama," published in January by Field Museum Press.

The Department of Geology will illustrate its current research and its continuing scientific work. There will also be an exhibit of Guatemalan volanic materials.

Literature on Guatemala, including books on pottery, textiles, flora and fauna will be shown in the library. Sketches made by participants in the Spring Journey, "Faces of Africa," will be shown beside their African-mask originals in the Hall of Primitive Art. A perennially interesting area, the taxidermy laboratory, where animals are mounted for exhibition, will be open. Taxidermist Carl Cotton and tanner Mario Villa will demonstrate their work.

Newly constructed and furnished offices of the Raymond Foundation, the Department of Planning and Development, the Division of Public Relations and the Women's Board will be open for members' inspection.

Throughout the day, the blue and white flag of the Republic of Guatemala, with its quetzal bird crest, will be flown beside the stars and stripes in front of the Museum.

NEW TOUR GROUP SLATED

THE OCTOBER 27–NOVEMBER 12 GUATEMALA TOUR has been filled and a later tour, equal in every respect, has been scheduled for November 17–December 3. Others who wish to make the trip may write Guatemala Tour, Field Museum, for reservations.

FIELD MUSEUM OF NATURAL HISTORY
Roosevelt Rd. & Lake Shore Drive
Chicago, Illinois 60605

Founded by Marshall Field, 1893

BOARD OF TRUSTEES

Lester Armour
Harry O. Bercher
William McCormick Blair
Bowen Blair
William R. Dickinson, Jr.
Joseph N. Field
Marshall Field
Paul W. Goodrich
Clifford C. Gregg
Samuel Insull, Jr.
Henry P. Isham
Hughston M. McBain
Remick McDowell
J. Roscoe Miller
William H. Mitchell
James L. Palmer
John T. Pirie, Jr.
John Shedd Reed
John G. Searle
John M. Simpson
Gerald A. Sivage
Edward Byron Smith
William Swartchild, Jr.
Louis Ware
E. Leland Webber
J. Howard Wood

HONORARY TRUSTEES

Walter J. Cummings
William V. Kahler

OFFICERS

James L. Palmer, President
Clifford C. Gregg, First Vice-President
Joseph N. Field, Second Vice-President
Bowen Blair, Third Vice-President
Edward Byron Smith, Treasurer and Assistant Secretary
E. Leland Webber, Secretary

DIRECTOR OF THE MUSEUM

E. Leland Webber

CHIEF CURATORS

Donald Collier, Department of Anthropology
Louis O. Williams, Department of Botany
Rainer Zangerl, Department of Geology
Austin L. Rand, Department of Zoology

BULLETIN

Edward G. Nash, Managing Editor
Beatrice Paul, Associate Editor, graphics

PRINTED BY FIELD MUSEUM PRESS

PAMPHLET—SOU ARCHIVE

BULLETIN **FIELD MUSEUM OF NATURAL HISTORY**

Volume 38, Number 5 May, 1967

Bird of the Mangrove Swamp

by Michelle B. Grayson, Research Assistant, Birds

Young Hoatzins are helped in climbing through the trees by finger claws on their wings, right; they lose the claws as adults. Far right; a nestling eats partially digested food. The baby bird puts its bill into the mouth of the parent to get its meal.

Illustrated by Tibor Peren

OCCASIONALLY, WHILE POKING through collections or browsing in the literature, one uncovers some fact so fresh and exciting that he breaks his routine to share it with others. For me, such a discovery was the Hoatzin. Few people would classify this bird as beautiful. It is certainly not graceful or colorful; nor unusually large or powerful, but unquestionably unique. From appearance to habits it ranks alone. The Hoatzin (family Opisthocomidae) is a sedentary bird of the heavily-wooded river banks and permanently flooded forests along overgrown river banks of South America. The Amazon is considered the center of distribution although Hoatzins occur from Guiana and Brazil to Colombia and Bolivia. These birds can exist only where certain marshy plant foods are available. They eat the tough leaves, flowers and fruits of these plants as well as small animals (fish or crabs) picked from the mud under the brush.

In general appearance, they are slender birds. A little over two feet long, head to tail, they weight only about one and three-quarter pounds. The plumage of the back is dark brown, spotted in places with white. The underparts are a light rusty color. The tiny head sports a long, erect, and bristly reddish-brown crest.

Breeding, which is apparently not restricted to a specific season of the year, occurs in colonies. The nests consist of simple stick platforms in the trees, usually four to fifteen feet above the water. The normal clutch includes two to four small yellowish eggs with pinkish spots. To feed, the almost featherless young put their heads into the gaping bill of the parent. The chicks are adventurous and make excursions early. They have, in contrast to the adults, a good grip with their feet and employ their bills in a manner similar to the parrots for climbing.

When alarmed, nestlings will dive into the water. They swim on or below the surface, utilizing both

their wings and feet in the process. An intruder is often unable to mark the progress of these remarkable babies except by the periodic reappearance of pairs of watchful eyes. Later, with danger passed, they climb out of the water onto overhanging branches. This escape, which is very suggestive of climbing reptiles, is aided by large temporary claws (moveable by special muscles and reminiscent of the wing structure of *Archaeopteryx*, extinct for 150 million years) on the first and second fingers of the wings. The corresponding flight feathers of the wing are retarded. Mature birds lose these claws and have normal flight feathers. However, they retain the habit of using their wings for climbing, often breaking their primaries in the process.

The single representative of its family, the Hoatzin is noteworthy in many respects. Systematically, it is believed to be closest to the quails, pheasants, and turkeys, but it retains many similarities to other birds ranging from the primitive *Archaeopteryx* to very advanced living birds. The digestive system, unlike most other birds, makes use of the crop rather than the gizzard for breaking up food. The resulting size and weight of a full crop tend to make the bird top heavy and cause him to crouch and rest his breastbone, which has a specially-developed callous, against the perch. Adults maintain their equilibrium while hopping between branches by spreading their wings and flapping their tails.

Another distinctive feature prompts the local name "stinking bird." They have a musky odor which varies with the season and individual. The widely-accepted rumor that the flesh also contains this odor accounts for the natives' neglect of the birds except for occasional medicinal purposes.

The presence of a group of Hoatzins is heard from afar. Their voice is remarkable for its harshness, varying from a hissing screech to a grunting croak. The name "Hoatzin" is of pre-Colombian origin and supposedly resembles the call.

Hoatzins are easily captured. A strong light seems to transfix them enough to allow a man to lift one off its perch. However, they do not live well in captivity.

Their inflexible routine is illustrated by the onset of breeding with every rainy season, independent of the frequency per year. There is also a case of note in which several breeding Hoatzins returned to their nests in a fallen tree. These birds starved to death while others lived nearby in growing trees.

So far, these birds have not been exploited. They have been allowed to remain obscure because no real use has been discovered for them. Useful or not, they too are beginning to feel the effects of civilization. Their already limited environment is dwindling and, therefore, man is their greatest though most unintentional predator.

lecture

DR. J. L. FRANCO ON AZTEC MUSIC

On Sunday, May 21st at 3 p.m., Dr. Jose Luis Franco C., a Mexican archaeologist, will give an illustrated lecture at the Museum on the pre-Hispanic music of Mexico.

Dr. Franco has spent many years studying the archaeology and the ancient writings of Mexico to understand the systems of pictographic writing developed by the Olmecs, Mayans, Zapotecs, and the Aztecs. As part of his general interest in the living culture of Middle America as it existed before the Spanish conquest, Franco specialized in the music of that period and has become one of the outstanding experts on the pre-Hispanic music of Mexico.

By consulting the works of Fray Bernardino de Sahagun and other Spanish observers who wrote shortly after the conquest he was able to learn much about the Indian schools of music, the part that music played in pre-Hispanic culture, and even to get an idea of how the music sounded.

Pre-conquest sources such as the Aztec and Mayan codices occasionally depict pre-Hispanic musical instruments and show them in use. Stone and clay representations of musical instruments are numerous and there are a surprising number of drums, flutes, whistles and raspers that have survived from pre-Hispanic times. It is possible to play the clay and bone flutes and the rattles and bells that have been excavated from archaeological sites. Dr. Franco has mastered several of these instruments during the course of his studies.

The music of ancient Mexico was an important part of the festivals held several times each lunar month to honor the gods. The rhythm of the music was carried by voices singing in monosyllables and polysyllables in cadence with the instruments. This use of a repetitive mixture of syllables to keep time was quite common, but there were also songs that told a story.

Pre-Hispanic musical instruments include both percussion and wind instruments. One of the largest and most important of the percussion instruments was the *huehuetl*, an upright drum made of a hollow log topped with a skin drumhead which stood waist high to the player. This instrument was accompanied by the *teponaztli*, a smaller hollowed log set on its side and played by striking the square tongues of wood that almost cover the "H"-shaped orifice of this instrument. The two tongues were of different length, which resulted in giving each a different pitch. Fortunately, several examples of both kinds of drum survive from the time of the Spanish conquest. These instruments are still being used today in the state of Tlaxcala and elsewhere in central Mexico. A third type of drum was made of pottery and had a skin head.

The wind instruments included flutes, ocarinas, whistles, and trumpets. These were made of bone, pottery, shell, cane or wood. The numerous raspers, rattles and flutes unearthed in Mexico make up in interest for their lack in size.

Dr. Franco's discussion of the pre-Hispanic music will offer a unique opportunity to learn about an important but little known aspect of ancient Mexican life. Dr. Franco will speak in the Museum Lecture Hall. Members and the general public are cordially invited to attend.

—by John Hobgood, Chicago Teachers College

AS DONE BY WALTER KEAN

GEM FACETING

One of the consistently popular exhibits in the museum is the Higinbotham Hall of Gems. The gem specimens in it consist both of faceted or carved stones and examples of the rough starting material minerals from which gems are fashioned. Although we exhibit a large number of small stones of a few carats or less (there are roughly 140 carats to an ounce), we attempt, whenever possible, to obtain larger stones of 10 carats and up to provide spectacular examples of the gems themselves as well as the gem cutter's art. Over the years the public has come to expect specimens of extraordinary beauty and size in the major museums of the world, and indeed a museum is generally the only place where large stones are to be seen at all, excepting the few remaining crown jewel exhibits scattered around the world.

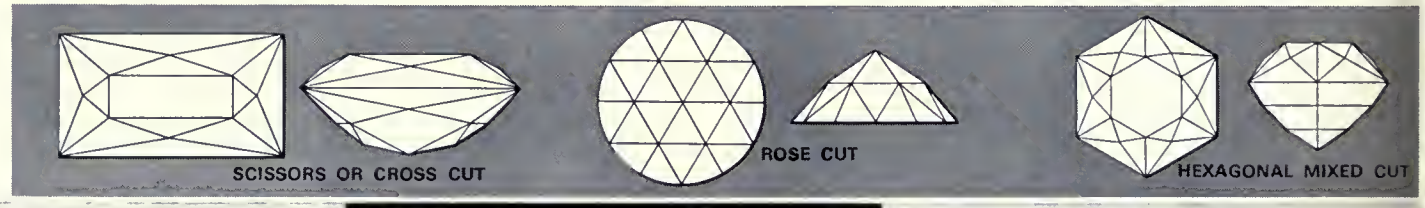
One of the major problems for museum gem collections today is that of getting large gemstones cut and faceted. For many reasons commercial gem cutting companies do not care to handle very large stones, and even if they could be induced to cut them the cost would be prohibitively high.

Over the years the Field Museum has slowly acquired a number of rough gems of moderate to large size. Some of these were added to the study collections and others were put on exhibit as good examples of rough stones. Generally, the thought was always in mind that some day some of these rough stones should be faceted, although we were never certain just how this would be accomplished. Then in 1963, through a series of fortunate coincidences, the museum made arrangements with Mr. Walter Kean of Riverside, Illinois to cut, initially, a large rough specimen of kunzite, which had been acquired two years earlier.

Mr. Kean is not a professional gem cutter. He is, in fact, a radio engineer and heads a consulting engineering firm which works primarily with the design of output antennas for broadcasting stations. Gem faceting is a hobby he started in 1961, teaching himself on homemade equipment. After two years of self training and experimentation he entered his first competition, the Chicago Lapidary Club–Chicago Park District annual show. His entries won him trophies for the best faceting work and the best master exhibit. He received the same awards again in 1964, and in 1965 he entered the mid-west regional competition which is run annually by the Midwest Federation of Gem and Mineral Societies. In this he received a ribbon for the best work in the masters' class, and a trophy for the best faceting of the whole show. Since 1963 Mr. Kean has faceted an impressive array of stones for the museum: Kunzite—63.5 carats, Tourmaline—13.3 carats, Topaz—91.0 carats, Kunzite—294.8 carats, Orthoclase—8.0 carats, Aquamarine—9.1 carats, Beryl—169.7 carats, Aquamarine—11.0 carats, Beryl—117.0 carats.

Added to this list just recently is a giant, flawless white topaz which weighs 1413 carats (about two-thirds of a pound). This particular piece came from a rough stone which had

Above, Research Associate Walter Kean holds huge topaz he faceted for Field Museum. 1,413 carats. Below, diagrams of Standard cuts used by gem cutters, and photos



— A PRECISE ART

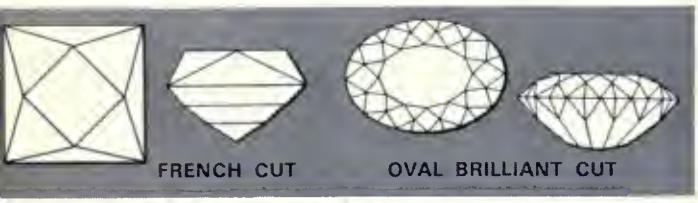
been in the mineral collection for 45 years and was not considered to be of gem quality. Mr. Kean ran across it quite by accident and thought it had "possibilities" (see photo). It is the largest stone he has ever attempted to cut and the results are spectacular. This piece will be on exhibit in the Hall of Gems.

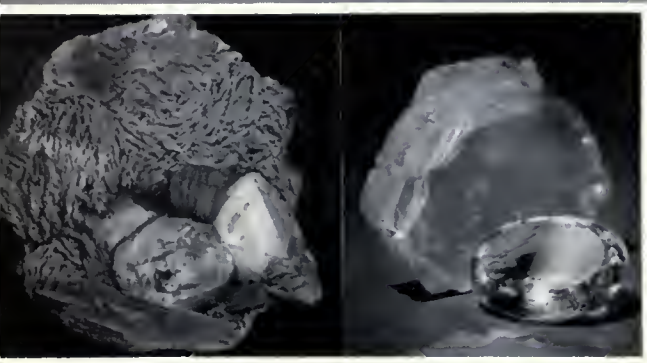
His remarkable success in gem faceting in just these few years is undoubtedly due to the fact that he has approached this work more as an engineering problem than a strictly artistic one. In reality, gem faceting is not an *art* in the accepted sense as it applies to painting, sculpture or music. A painter, for instance, attempts to capture a mood or thought —if he is too literal in the technique he uses, he may be accused of being photographic and not truly artistic. In the cutting of gem stones, however, there is no great latitude in technique. A gemstone has a number of physical characteristics which, in themselves, can aid or hamper the faceting. The cutter cannot ignore them. Gem garnets, for example,

Walter Kean approaches each stone as a unique problem. He rarely uses formulas, but designs each stone around its own color, refraction index, natural flaws, and size. He works with home made equipment by choice. When he began cutting stones, he looked over the existing manufactured equipment and was not happy with what he saw. Most of it was not precise enough for extremely precise work. So Mr. Kean designed and made his own equipment, doing a great deal of the machining necessary. He also modified some commercial equipment to gain the tolerances he needed for close work.

The results of all this care are truly remarkable. The best example of his precision approach can be seen by comparing standard faceting with his work in the Hall of Gems. We have on exhibit two specimens of gem orthoclase, both from the same mine in Madagascar. One, a 5.6 carat stone, was commercially faceted; the other, eight carats, by Walter Kean. The difference is startling. The first stone is rela-

e stone, pictured at right and on the cover, weighs
uncut gem-stones in the Museum's collection.





have a deep wine red color, often so intense that faceted stones which are thicker than a fraction of an inch appear black. Such stones demand a very shallow cut, just to allow light through.

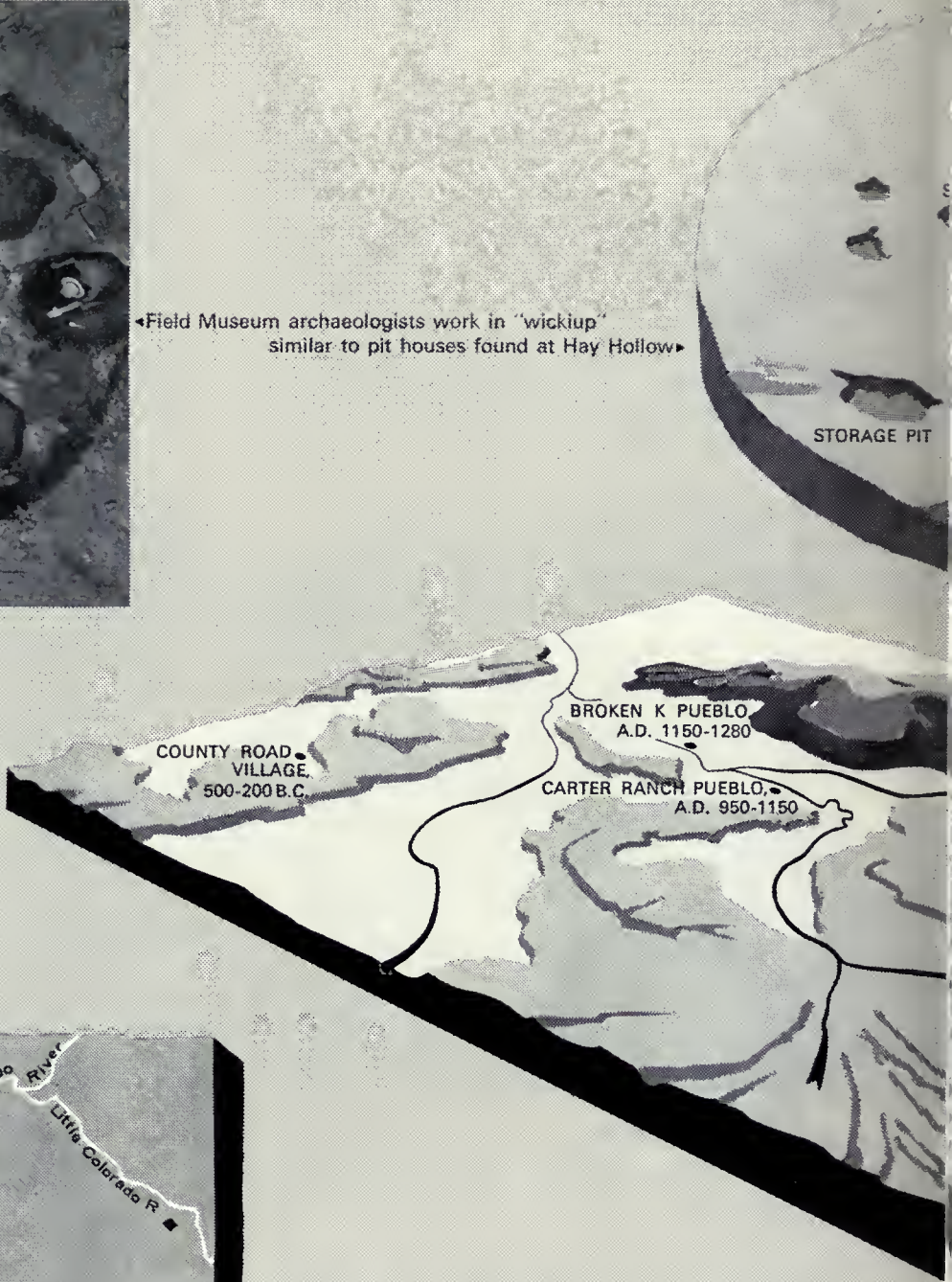
All gems have an optical characteristic called the index of refraction. How high or low this value may be governs the angles which the many facets make with each other. A stone faceted with the wrong angles for its index of refraction will look dead no matter how fine a polish the cutter may give it. It would be quite possible to cut the finest diamond in the world and make it look like a piece of glass, by using the wrong set of angles.

tively dull and pale yellow. Kean's stone shows a gleaming array of colors and a brilliant polish.

Besides cutting gemstones for the museum, Mr. Kean has been instrumental in our acquisition of a number of rough stones as well as the giant blue Chalmers Topaz (5890 carats), which was acquired already faceted. In recognition of the services he has performed for the museum, Mr. Kean has just been appointed to the honorary position of Associate in Mineralogy in the Department of Geology. Thus, our museum is at last in the enviable position of having a resident gem cutter, which means the gem collection will be able to grow actively over the coming years.

HAY HOLLOW

◂Field Museum archaeologists work in "wickiup" similar to pit houses found at Hay Hollow▸

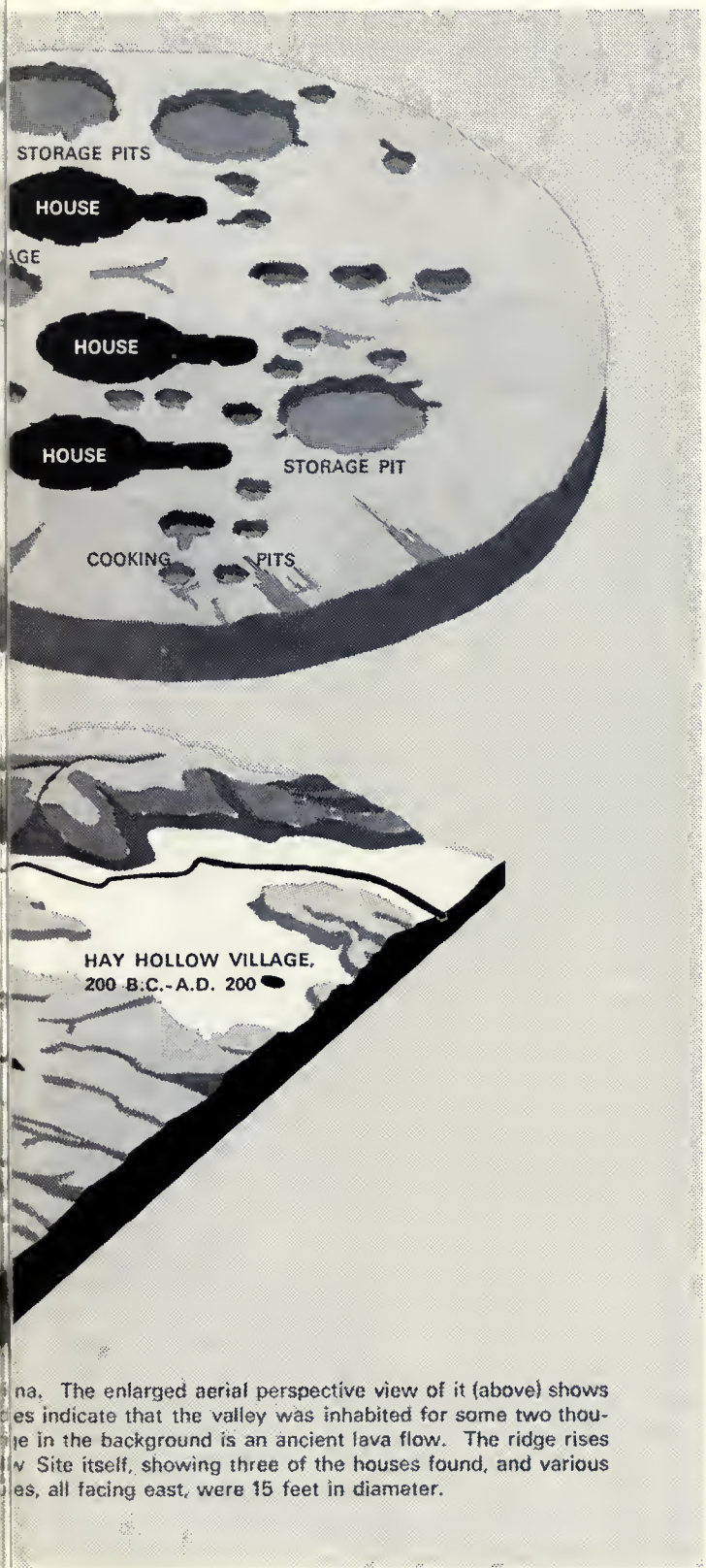


Map at left locates a 20 square mile section of Navajo Country, the location of Hay Hollow and other excavation sites. Carbon-1 sand years. The dry stream bed fills only after heavy rains. Th 500 feet above the valley floor. At top is a section of Hay H cooking and storage pits. Most pits were three feet deep. The

AERIAL PERSPECTIVE PROJECTIONS BY LIDO LUCCHESI

V SITE

by PAUL S. MARTIN, Chief Curator Emeritus, Anthropology



na. The enlarged aerial perspective view of it (above) shows
es indicate that the valley was inhabited for some two thou-
ge in the background is an ancient lava flow. The ridge rises
v Site itself, showing three of the houses found, and various
es, all facing east, were 15 feet in diameter.

About 2,000 years ago, in eastern Arizona, a small group of Indians was wresting a living from a formidable and arid area. Their living pattern was centuries old, for their forefathers had hunted big mammals—mastodons, horses, camels—and probably had eaten nuts, berries, seeds and roots. When the big game became extinct, they hunted smaller animals—deer, mountain sheep, rabbits—and continued to gather and eat wild plant foods. Sometime prior to A.D. 1, they had heard about planting seeds (corn) to produce food; and they had begun in a dilatory fashion to experiment with this novelty. Eventually, the use of this new plant profoundly modified the way of life of all later Indians.

This, in capsule form, was what we knew or thought we knew about Hay Hollow Valley, eastern Arizona, in 1963. Our suppositions were based on our knowledge of the cultural history of the area and on our comprehensive examination of the valley.

Since 1963, we have been seeking new directions and values for our archaeological researches. One of our chief aims was to discover, trace and describe the evolution of the social and cultural development in a restricted area.

The catch-all phrase "social and cultural" means: man's adaptation to his total environment, social and physical; his ability to adjust to changes in the environment; his social institutions, such as rules of marriage, definition of kin-folks, connections—blood and social—between persons and families; rules of descent and inheritance; inventory of artifacts—tools of stone, bone and of fired clay (pottery); methods of making artifacts and their functions; houses; places o worship; ritual; clothing; foods and methods of preparing—and so on. In short, it includes everything man does, thinks, creates. One may say that this *is* culture and one might organize these categories into three segments, the economic, social, and religious subsystems. If any segment of this delicately balanced articulation of components is disturbed by change of climate, by warfare, by movements of people, by any demand or strain, the other subsystems or segments probably will also change accordingly.

To work out the social-cultural system in this little valley, we had first to examine the valley with care and to determine the chronological spread, the geographical boundaries, and the range of cultural diversity as represented by sites.

This we have done in part. We know the valley was first settled by 1000 B.C. or earlier, inhabited continuously until A.D. 1350, at which time it was abandoned. The valley is roughly 20 miles long and from 2 to 10 miles wide. The cultural variability ranges from hamlets occupied seasonally by hunters and gatherers through villages of pit-houses, through villages of a few surface contiguous rooms to very

large villages of contiguous rooms several stories in height.

We have excavated and reported on two of the larger, latest villages; we are now engaged in investigating the earlier end of the time scale. For the past two summers, we have concentrated on Hay Hollow Site, occupied between 200 B.C. and A.D. 200 by a hunting-gathering folk who were in the process of adopting and adapting to corn agriculture. The work has been done with the support of National Science Foundation and National Science Foundation Undergraduate Participation Program.

Although analyses are incomplete and conclusions tentative, I should like to give you a glimpse of what we found and what we think about it.

This ancient village is located on a gently sloping terrace or shelf that stands about 30 feet above the Valley floor. The Valley was once watered by a permanent stream, but now carries water to its parent stream, the Little Colorado River, only during and after heavy snow or rain.

The crude huts that once sheltered the hunters-gatherers were protected from the violent wintry winds by a pink, shaggy sandstone cliff some 60 feet in height. Scattered about at the bottom of this rocky outcropping are huge roundish boulders that look as if they had been tumbled there by giants.

The countryside was pleasing, and although arid, was not a barren, sandy wasteland. On the contrary, pinyon and juniper trees were common and although not more than twenty feet in height, presented a pleasing contrast to the pink and gray cliffs. Near the stream grew wild walnut trees and willows, the bark of which could have been used to make a brew with aspirin-like characteristics. The average annual rainfall was 13 inches.

The reddish soil produced a score or more of wild plants and grasses, most of which the Indians utilized for food, medicine, or dye. A few of the more common plants still present in the area are barberry, beargrass, goose-foot, groundcherry, Indian rice grass, mallow, mountain tea (*Ephedra*), plants of the mustard family, saltbush, sagebrush, squawbush, yucca.

In the Valley were several other contemporary villages similar to ours, hence social contacts were available.

This, then, was the scene of primitive human activities some 2,000 years ago—a valley where water was available, game present, with an abundance of vegetal foods waiting to be harvested, wood for constructing houses and for use in fires, and stones of all varieties from which tools and implements could be fashioned.

The village 2,000 years later, as we first saw it, was recognized as an "early" site only because of the well-trained, sharp eyes of the observers. The tell-tale signs were occasional slabs of sandstone reddened by fire, bits and pieces of chipped flint, chunks of tough igneous rocks that were battered, large boulders that had been transported to the site by man to be used as cores from which usable flakes could be struck, and portions of milling stones. No sign of a house or of pottery.

Now, two years and thousands of man-hours later, we know a great deal about the physical appearance of the site, and a little later we shall be able to make statements concerning the social life and order of the village.

A random sample of 60% of the entire site was examined and excavated and 90% of all features (houses, firepits, storage pits, charcoal stains) were completely excavated. All stone chips, stone tools, milling stones and fire-cracked rock were saved and taken to our field headquarters for weighing, measuring, classifying, description and tabulation. Samples of dirt from which fossil pollen might be extracted were taken from 200 key spots. All pieces of charcoal were salvaged by means of tweezers and wrapped in heavy aluminum foil to prevent contamination. Twenty-two chunks were sent to a laboratory for carbon 14 dating.

If you had visited the site while work was in progress, you might have been disappointed. Indeed, some of our visitors asked "where is it?" You would have seen piles of sifted dirt, stakes, holes, pits, rocks, leveled-off places and charcoal-stained areas. But out of this apparent chaos, we have obtained an amazing amount of significant data.

Preliminary analyses suggest that most of the features fall into three major clusters, each separated from the others by one hundred feet or so. Each cluster contains from one to three houses, one to three large pits (6 to 12 feet in diameter) and many smaller pits, some of which served as hearths and some as storage chambers. The firepits and general refuse areas all lie downwind from the houses.

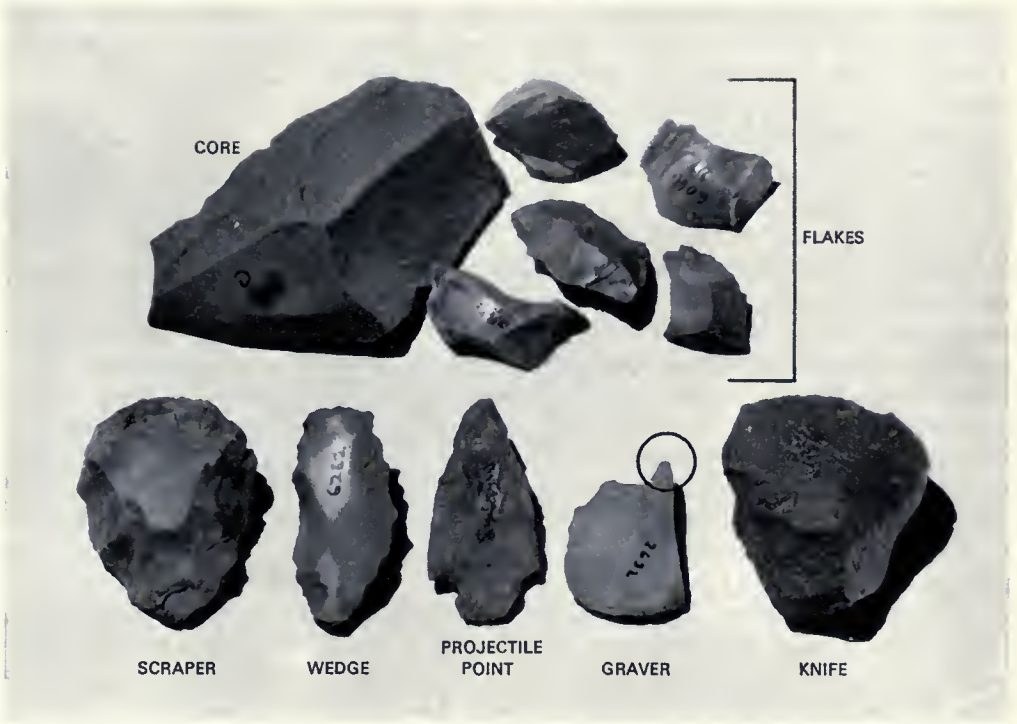
Each house was round, about 16 feet in diameter, and was provided with a saucer-like dirt floor, the center slightly lower than the rim. Around the rim or edge, juniper or pinyon-wood poles were set in holes. The poles were placed about 6 inches apart and leaned slightly toward the center of the house. We are not sure just how these poles were fastened at the top-side. It may be that they were tied together like those of a tepee, leaving a small smoke hole where all the poles met; or the poles may have been slightly arched and fastened to a superstructure so as to form a dome-like hut. In this case, the house would have resembled a contemporary Apache wickiup. We tend toward this latter interpretation, although we are guessing.

The interstices between the upright poles were chinked with grass, brush and mud, very much like the chinking in early American log cabins. Great hunks of this chinking were actually found on house floors. The chinking *was* mud, leaving the imprint of grass, fingerprints, brush and twigs, and preserved by great heat. In other words, when the house was destroyed by fire (and they had *all* burned), the chinking was roasted to brick-like color and consistency! This kind of construction is called "wattle and daub," or by the Spanish term, *jacal*.

The Indians entered the house by crawling through a roofed tunnel about 6 feet long. The covered entryway always opened toward the east and was roofed and walled by means of wattle and daub. The floor of the tunnel sloped slightly downward toward the center of the house. It is probable, although the evidence for this is not too good, that the eastern or outer end of the tunnel could be closed by means of upright slab-doors or a skin portiere. As the crawling visitor to the house reached the house—or west end of the tunnel—he would have been confronted by a two-foot-high partition made of upright slabs that curved in a gentle spiral

The drawing at right shows how a prehistoric "wickiup" might have looked. Pit houses were constructed with a series of posts in a circle. The posts were pulled together into a dome shape and covered. The covering material used at Hay Hollow was most probably mud daub. All of the houses found at Hay Hollow had been destroyed by fire.

Examples of Southwest Indian stone tools, all taken from Hay Hollow Site. Large stone at top is a typical core, from which flakes are struck (right). These flakes are then shaped into various tools. Lower row, left to right, a scraper, used on wood, bone and skins; a wedge, for splitting bone or wood; a projectile point, for hunting; a graver, for carving designs and personal marks on stone, wood and bone; and a knife, used for cutting meat and leather. The tools shown came from different cores, some flint, others quartzite. Relative frequencies of tools in a specific area of the site may give clues to the function of that area; thus, presence of cores, flakes, and debris may indicate that the area was a tool manufacturing area; presence of both knives and scrapers might indicate a food and skin processing area.



toward the rear, leaving a space just wide enough to accommodate a thin person. This partition was placed there as a kind of deflector to keep cold draughts from striking and scattering the embers of the fire or from chilling the occupants.

The interior furnishings of the house were simplicity itself: a small fire hearth, a few covered food storage pits, a milling stone or two, a few stone knives and perhaps several skins that served as cushions or blankets.

It may be of interest to note that all houses of this type as well as all later pit houses in the Southwest were provided with east-facing tunnel entrances and with deflectors. In fact, the ventilator tunnel and shaft found in almost all southwestern kivas (religious structures) of later times evolved from the earlier entry-tunnel and likewise opened toward the east or southeast. Further, almost all kivas were supplied with deflectors—some of which were painted.

Near the east or outer opening of the house tunnel were two firepits. These may have been used for household cooking since the interior hearth was used exclusively for heat or light.

Each cluster of houses was adjacent to several large pits and many smaller ones. The large ones may have been furnished with pine boughs and furry skins and in these some of the family may have slept as do the contemporary Apache Indians. Conversely, they might have served as barbecue pits or for food storage.

The numerous smaller pits were undoubtedly used in connection with cookery of some kind. Some may have been utilized for "cooking" flint rock or to put it more elegantly, for thermal treatment of flint cores.

Don Crabtree, of Idaho State Museum, Pocatello, Idaho has demonstrated that untreated flint (chert) is fractious and difficult to flake. Long, slow thermal treatment (48 hours or more) and slow cooling of raw, unworked flint nodules makes

them glassy in appearance and as easily worked or chipped as glass or obsidian (volcanic glass). Natural glass is the easiest of all rocks from which chipped or flaked implements (arrowpoints and the like) may be made. An expert can detect a thermal-treated flint tool at a glance.

By means of tedious counting, classifying and even weighing of over 50,000 worked or chipped pieces of flint, of over thousands of fire-cracked sandstone slabs, of tough igneous-rock hammers, of milling stones, of pottery fragments, so that the distribution of the frequencies of each tooltype could be plotted on site maps, we have an excellent idea of the village's "activity-structure." By this, I mean the *kinds* of work programs that were carried on and *where* the work was actually accomplished and *who* did it. This type of information is essential if we wish to make statements about how the village was organized for doing certain jobs and who was involved in this organization. This, in turn, gives us clues about the social organization.

The artifacts were distributed spatially in a non-random manner. That is to say the various tools were not scattered in a haphazard way but, rather, were left more or less exactly where the people used the tools and left them. We are fairly certain that certain tasks were almost always accomplished in prescribed places. It follows, then, that when we find a clustering of a tool type in a specific area, we have found the area in which a particular job was done.

Potsherds (broken pieces of pottery) are a good example. Potsherds are chiefly associated with hearth areas. This distribution indicates that pottery was used primarily for cooking and not for storage. Two more facts about the pottery strengthen this hypothesis: all the sherds are sooty, and the vessels are of so small a size as to almost preclude the possibility of their use as storage containers. Incidentally, this pottery may be among the earliest in the Southwest, because it was surely present at 400 B.C. or earlier.

Other examples of clusterings of tool types are 1) milling stones were found only in or near houses. Since reducing seeds and other foods to flour or paste is the job of women in most documented "primitive" societies, it seems likely that milling was done by women in or near houses; 2) tools employed for cutting, sawing, hacking, and scraping occurred in large numbers in the vicinity of smaller roasting pits. This correlation indicates, at the minimum, that butchering and cutting of carcasses and scraping of skins for clothing were carried on near hearths; 3) an aggregation of the bases or stem-ends of projectile points and quantities of stone flakes suggested the area in which the men of the group manufactured projectile points. After a hunt, spear or arrow shafts were brought home for re-use. If the tip of the projectile point had broken off when striking and wounding the game, the basal portion would remain in the shaft and could be replaced by a new point.

The location of the work areas is thus spotted by plotting the frequency distributions of each tool type and this is made possible by having "control" of the find-spot of each chip, artifact and sherd.

Now, from these data what can we say about the social units that performed tasks necessary for the day-to-day survival of the group? At the moment, only a few suggestive hypotheses can be made. Our analyses must proceed further before we can say more.

Each house probably housed a single family—father, mother, and 2 or 3 children. The residence pattern was probably neo-local. This term implies that upon marriage, the newlyweds built a new house. This is in contrast to the husband taking up residence with his wife's family (matrilocal) or the wife, with her husband's family (patrilocal). Cooking was mostly done outside by means of stone-boiling, by roasting, or by barbecuing. We don't know if the families living in each cluster were related by blood, or brought together by similar work tasks.

Up to this point, I have merely described the site, our findings, and our tentative hypotheses. I have dealt exclusively with events, details and particulars. As a basis for further studies, these particulars are important; but we must take the next steps, the first one of which is to generalize from these details. We are eager to go on to discuss the cultural process, which is one of the goals of anthropology.

When our analyses are complete, we will possess a set or a network of functionally related culture elements, like building blocks all put together, articulated in working order to produce a whole—a *system*. The structural units of our system comprise some of the things I have mentioned: type and size of house and its relation in space to other houses; cooking and storage pits; kinds of tools and pottery; foods and methods of preparing; specific areas where certain tasks were carried on; division of labor; probable composition of work groups and of social organization; and forces that intergrated the people into a functioning society.

This is a *system* as seen at a *single point in time*, and must be formulated before we can make comparisons or deal with culture processes and regularities or "laws"—our ultimate goal.

A process involves change with continuity; a process is the study of how a "system" at 2,000 years ago is transformed into a different "system" at A.D. 500 or A. D. 1,000 or at any later point in time. Process, then, represents views of cultural patterns undergoing change. It is like a movie with one frame (a system at a single point in time) succeeding another. The viewing of this movie is basic to our task. But it is not all.

Our final goal is to seek trends and *causes* of human behaviour. Culture exhibits certain lawfulness—it is not irregular or capricious. If we study events (systems, culture processes) with the view of discovering their regularities, we shall perceive that cultures behave in accordance with fixed and universal laws. By "law," I mean a statement of a constant relationship between two or more classes of phenomena under stated conditions. For example, the more adapted and and specialized a culture, the less adaptable it becomes. Hence, its downfall is a probable outcome of its successes, as in dynastic Egypt.

It will be some years before we can formulate the laws from our Hay Hollow Valley data. They will be the product of many students working together and pooling their efforts. All we can claim now is that we have made a strong beginning.

Missionaries as Collectors

by Christopher C. Legge, Custodian of Collections, Anthropology
and Patricia M. Williams

None of the Pacific missionaries of Michener and Maugham is more interesting than John Williams, James Calvert and Dr. Richard Burdsall Lyth. In addition to fulfilling their mission work, each of these men made valuable ethnological collections, specimens of which are in the Museum's outstanding Fuller Collection.

According to the Dictionary of National Biography, John Williams, 1796–1839, ". . . was the most successful missionary of modern times. He acquired the languages and adapted himself to the varying characters of the races he encountered in a manner most remarkable for a man of his defective education." Williams was sent to the Pacific in 1817 by the London Missionary Society and made his permanent headquarters at Raiatea in the Society Islands Group. He became an active and ambitious missionary of many accomplishments. In 1819 he introduced sugar cane into Tahiti and erected a cane mill. In 1827 at Raratonga in the Austral Group, Williams built *The Messenger of Peace*, an 80-ton ship. This was a particularly ingenious feat as he had no iron nails, saws or other proper tools. (The ships of the London Missionary Society have sailed under the name *John Williams* since 1844. The vessel presently in service is the *John Williams VII.*) Williams translated the New Testament into Raratongan and in 1834 he returned to England to have his translation published. His *Narrative of Missionary Enterprise in the South Seas* was published in 1837.

The Messenger of Peace.

Williams then returned to the Pacific only to meet a grisly fate. He was killed and eaten by the natives of Eromango Island in the New Hebrides. Presumably, his murder was committed in retaliation for cruelties inflicted upon the natives by a party of sandal-wood traders.

There are three specimens originally collected by Williams in the Museum's Fuller Collection: a fishhook from the Society Islands, a Tahitian headrest and a Samoan coconut-stalk club. The large, barbless hook is made of black-lipped pearl shell, with sennet fiber binding attached. Originally, Williams presented the hook to his biographer, Rev. Ebenezer Prout, F.G.S. The four-legged headrest is cut out of one piece of light brown wood. The Samoan club is of light brown wood covered with incised designs. An old manuscript tag attached to the club reads: "This club was brought back to England in 1834 by John Williams, Missionary—'the Martyr of Eromango'."

James Calvert, 1813–1892, was one of the first Methodist Missionaries in the Fiji Islands. He arrived in the Fijis in 1838 when he was 25 years old and remained until he was 43. He was co-author, with Rev. Thomas Williams, of *Fiji and the Fijians*. Williams wrote Volume I devoted to the islands and their inhabitants, and Calvert wrote Volume II on mission history.

The Fuller Collection houses three specimens from Calvert's collection. The first is a headrest from Tahiti made of dark wood. It is in three sections—the bar is the Fijian type and the supports are like those of Tonga. The second specimen is a throwing club from Tonga, the head of which is patterned and round in shape. Third in the collection is an intricately carved set of two bowls connected by a wooden ring. Remarkably, the entire set was carved out of one piece of dark brown wood. The ring links through a perforated lug at the end of each flower-shaped bowl.

The final member of this trio of missionaries is Dr. Richard Burdsall Lyth, 1810–1887, who was the first qualified medical missionary in the Pacific. He began working in the Tonga Group early in 1838 and moved to the Flji Islands the following year, where he stayed until 1854. He served as Chaplain to the British forces in Gibraltar from 1859 to 1878.

The Museum has one piece which was collected by Dr. Lyth, a breast ornament from Fiji made of a single gold or orange cowrie shell with a hole piercing one side. This shell is the rare *Callistocypraea aurantium* (Gmelin). When Fuller obtained the specimen about 1905 there was a small note in it which, in part, reads: "The Orange Cowrie is only found at one spot in the world *viz* on the reef of Nadroga (from Nandro-nga with accent on last syll.) or Flying Duck, S. W. of Viti Levu, Fiji Is. Specimens with a hole in them have been worn by the betes or priest while performing solemn acts of divination under the inspiration of their gods. The shells were always oiled on these occasions as were also the bodies of the betes. This specimen has been so used and treated. From Rev. R. B. Lyth. Rev. J. Nettleson" This information is incorrect insofar as the cowrie may be found in other parts of the Pacific.

HUMANITIES FOUNDATION GRANT

A GRANT OF $7,100 has been awarded to Field Museum by the newly established National Foundation on The Arts and The Humanities. The grant will support a project under the direction of James W. VanStone, Curator of North American Archaeology and Ethnology, entitled "Ethnography and Recent Prehistory of the Nushagak River Eskimos, Alaska." These Eskimos live in southwest Alaska in an area first penetrated by the Russians in the early 19th century. Since that time, the Eskimos of the area have had more or less continuous contact with western civilization through missionaries, miners, the fishing industry and government services. Mr. VanStone will investigate the culture of these Eskimos as it was before western contact, and the changes in their society as a result of more than a century of contact. "An Annotated Ethnohistorical Bibliography" of the previous work done on these Eskimos has already been accepted for publication by Field Museum Press in the series *Fieldiana: Anthropology*. The bibliography will be the first of several monographs planned by Mr. VanStone on the people of the Nushagak River area.

The general mission of the National Foundation on the Arts and the Humanities is to bring the American public into a more meaningful contact with the humanistic traditions; accordingly, the Foundation is encouraging museums involved in the study and preservation of these traditions. Field Museum has entered into an intern program with the Foundation, to train Museum curators of small museums in the techniques and skills necessary for the most effective preservation, restoration and exhibition of collections, as well as to give an insight into the relation of these collections with the traditions of human society. Field Museum participates in this program, one of the first established by the new Foundation, along with nearly a dozen other Museums throughout the country, including the Smithsonian Institution, the University Museum, University of Pennsylvania, and the New York State Historical Association.

ADD EXPERTS TO TOUR ROSTER

SPECIALISTS ON BIRDS and handicraft from Guatemala will help make Field Museum's Guatemala Tours, October 27–November 12 and November 17–December 3, more informative. Arrangements have been completed recently for Dr. Jorge Ibarra, Director of the National Museum of Natural History in Guatemala City, Editor of the natural history and conservation magazine, *Historia Natural Y Pronatura*, and Central America's leading ornithologist, to accompany the Field Museum Tour groups on bird walks near Lake Atitlán and to address them on Guateman birds.

Doña Lilly de Jongh Osborne, author of books about Guatemala and its handicrafts, will meet the groups at dinner in Antigua and will speak to them following dinner. Born in Costa Rica and a resident of Guatemala City since 1905, Doña Lilly is generally regarded as the leading authority on Indian handicrafts in Guatemala and El Salvador. She is the author of *Indian Crafts of Guatemala and El Salvador* and, together with Vera Kelsey, of *Four Keys to Guatemala*. Her collection of Guatemalan costumes and textiles is famous.

Other Tour specialists include Dr. Wilson Popenoe, Horticulturist of Antigua, and, accompanying the tour, Dr. Antonio Molina, Botanist of Escuela Agricola Panamericana in Honduras, Phil Clark, Garden Editor of *The News of Mexico* and Tour Leader, Dr. Donald Collier, Field Museum Chief Curator of Anthropology, and Dr. Malcolm Collier, former Assistant Editor of *The American Anthropologist*. Talks on life in Guatemala by Doña Carmen de Pettersen, and on coffee growing by Don Hugh Craggs, both plantation owners, also will be featured

Further information may be obtained by writing Guatemala Tour, Field Museum.

CALENDAR OF EVENTS

Museum open 9 a.m. to 6 p.m. every day

May 15 - June 30
Exhibit:
AMERICAN MEDICINE BEFORE COLUMBUS

One hundred small clay sculptures from tombs of ancient Middle America, on loan from the collection of Dr. Abner I. Weisman. The two-and-a-half-century-old human figures indicate physical ailments and their surprisingly sophisticated treatment in pre-Columbian times. In Hall 9 Gallery.

May 20
CHICAGO AREA SCIENCE FAIR

Best of the student science projects; display sponsored by Chicago Area Teachers Science Association. In Stanley Field Hall.

May 21
Lecture:
THE MUSIC OF ANCIENT MEXICO

Noted Mexican archaeologist, Dr. José Luis Franco lectures on Aztec music displaying and actually playing instruments recovered from Aztec tombs. At 3 p.m. in Ground Floor Lecture Hall.

June through August
Summer Journey:
ANIMAL IMMIGRANTS

Self-guided tour for young people of exhibits showing animals found in the United States, but native to other countries. Direction sheets and information available at both Museum entrances and at information desk.

MEETINGS

CHICAGO SHELL CLUB
May 21 at 2 p.m. and June 11
ILLINOIS ORCHID SOCIETY
May 21 at 2 p.m.
ILLINOIS AUDUBON SOCIETY
June 7 at 7 p.m.
CHICAGO NATURE CAMERA CLUB
June 13 at 7:45 p.m.

FIELD MUSEUM
OF NATURAL HISTORY
ROOSEVELT ROAD AT LAKE SHORE DRIVE
CHICAGO, ILLINOIS 60605 A.C. 312, 922-9410
FOUNDED BY MARSHALL FIELD, 1893

E. Leland Webber, Director

BULLETIN

Edward G. Nash, Managing Editor
Bea Paul, Associate Editor, graphics

BULLETIN FIELD MUSEUM OF NATURAL HISTORY

Volume 38
Number 6
June, 1967

ANIMAL IMMIGRANTS

by George Fricke, Raymond Foundation

Summer Journey tells the story of animals introduced and naturalized in America

ANIMAL IMMIGRANTS is the title of the Summer Journey for boys and girls that will be available during the months of June, July, and August.

The Journey will point out some of the common animals that have been introduced into America. Some of these exotics, as immigrant or alien animals are called, have become naturalized here; others failed to survive.

Some birds, like the Ring-necked Pheasant and the European or Gray Partridge, were introduced to provide sport. The Ringneck was successfully introduced in 1881; the Gray Partridge in 1908.

The two most common and widespread of all exotics are the English Sparrow and the European Starling. They are considered by many to be pests, precisely because of their success.

The English Sparrow was introduced in 1850 by Europeans who were homesick for this familiar bird. The Starling was introduced in 1890 by Eugene Schleifflin, a wealthy New York manufacturer fond of both birds and Shakespeare. He wanted to introduce all of the birds mentioned in Shakespeare's works.

Many insects have been introduced into America, often by accident. The common white Cabbage Butterfly arrived here in the 1860's from Europe. Early colonists introduced the Honeybee about 300 years ago.

More than 17,000 boys and girls have taken Museum Journeys since the program was started. Heer, three young men take notes about the snow leopard of Central Asia.

Two rodents accidentally introduced are the House Mouse and the House (Norway) Rat. Both arrived here accidentally as stowaways on ships sailing from Europe. The House Mouse came here soon after English colonists came to America. The House Rat arrived in 1775.

Carp were brought from Asia to Europe in historic times, and to America around 1880. In Europe and Asia they are desirable, but they are looked upon as pests in our country. The Carp's relative, the Goldfish, was brought over as an aquarium fish. People who tire of them often release them in lakes.

This is only a partial list of common animal immigrants found in America today. A complete list would fill several pages.

Journey No. 50

Animal Immigrants is Journey No. 50 in the Raymond Foundation's Journey program. The Journey program was planned to help children discover objects and items of interest in the Museum. The program helps children and adults to know how or where to enjoy the many opportunities offered in the Museum.

Four different journeys are presented each year. Only 80 children took the first journey, on Drums, offered in the Spring of 1955. Since 1955, over 17,000 have taken journeys. Some take only one or two, but others complete enough to earn award certificates.

An award program was set up to give some form of recognition for the children's accomplishments in the Journey program.

When a child successfully completes four journeys, he receives a Traveler's Award. When eight are completed, he gets an Adventurer's Award, and with 12 done, he becomes an Explorer.

Upon completion of 16 journeys, which takes four years, the Explorer becomes a Beagler, and is presented with a copy of Charles Darwin's *Voyage of the Beagle.* Then he is ready for the special Journey taking him through the Museum halls to see some of the specimens and objects Darwin saw on his historic journey.

Upon completion of this, the youngster becomes a member of the Museum Discoverer's Club. Some 125 children are either past or present members of the Museum Discoverer's Club.

Each Spring, a Traveler's Day is held in the James Simpson Theatre. In April of this year, 205 children were presented different awards.

Journeys are offered free of charge. The program is one of the many functions of the Raymond Foundation, one of the Museum's educational divisions. Journeys and information on the program can be picked up at either the North or South Door or at the Information Booth.

ARTS AND SCIENCE

An able staff of artists use their talents to aid the Museum research effort.

By Patricia M. Williams

FIELD MUSEUM'S series of scientific publications, *Fieldiana*, has long been recognized as a fine record of scientific research and achievement in the Museum's four fields of interest—Zoology, Geology, Botany and Anthropology. The successful presentation of this research has been due in no small measure to consistently excellent scientific illustration.

Illustrations for *Fieldiana* have been done by staff artists, independent artists on commission and, occasionally, by the author himself. Henry Dybas, Associate Curator, Insects, has added technique to talent to produce many of his own drawings.

Artistic ability has also been discovered among staff members engaged in other Museum work. Janet Wright, then Secretary to the Division of Amphibians and Reptiles, contributed many fine drawings to the publications of Dr. Robert Inger and Mr. Hyman Marx. Mrs. Lenore Warner of the Department of Botany, has recently provided a number of illustrations for Dr. Louis Williams' "Tropical American Plants." Joan Davis Levin learned the art of scientific illustration while working as assistant to the late Dr. Dwight D. Davis and her work appeared in his widely acclaimed monograph "The Giant Panda." This publication was "in the works" for many years and the illustrations in it represent the work of a number of artists, one of whom had spent many years as an engraver. His work is easily recognized by its minute and exquisite detail.

The use of color in *Fieldiana* is practically non-existent because of its high cost, therefore, most of *Fieldiana*'s illustrations are rendered in pen-and-ink and, occasionally, in pencil. Recently, however, several interesting variations have been seen. Ranier Zangerl, Chief Curator, Geology, used pencil on acetate for his drawings in "A New Shark of the Family Edestidae." Douglas Tibbitts, a former staff artist now free-lancing, uses pen-and-ink in combination with a wash for his bird illustrations to appear in Emmett R. Blake's *Manual of Neotropical Birds*.

As is true in all things, professional and personal, communication is a major problem for the science illustrator. For the scientist to adequately convey what he sees in his mind's eye to the artist is an often frustrating and time-consuming process. Once a rapport has been established between artist and scientist, the work can move quickly and satisfyingly for all involved.

The commercial artist is free to distort his subject to achieve the desired "image." For example, a car may be drawn longer and lower than it actually is, a refrigerator may appear taller and slimmer than it is in fact. Also, the commercial illustration must frequently connote the subject's intangible qualities. A bottle of soda-pop must seem at once to be not only cold and refreshing, but zestful, youthful and gay, as well.

Artist Marion Pahl working on an insect exhibit. Miss Pahl, like many artists on the staff, works in the Department of Exhibition, as well as doing scientific drawings, charts and maps for individual scientists.

The "popular" artist may portray a snake as an exotic, sinister reptile, eyes glittering with evil as it slithers sinuously out of the firelight into the shadows. In *Fieldiana*, the same snake would be a neatly tagged and coiled specimen carefully arranged to best show individual variation in scale pattern of the species.

Because the illustrations in the series are meant to be used as aids to research and not as decorations, the artist must strive for faithful reproduction and absolute accuracy. A flower need not appear to be dew-drenched and fragrant. In fact, it is far better if it does not. The dewiness may imply a scientifically inaccurate texture.

Although a scientific illustration may not be a deliberate expression of the artist's personality, like handwriting, it always bears the inescapable imprint of the individual. John Pfiffner's bold, sure pen-stroke; the delicate, lace-like quality of Lenore Warner's botanical drawings; and the fine precision of Marge Moran's mollusk illustrations are all unmistakably unique.

Even though photographs are more quickly done and, therefore, less expensive, it is sometimes impossible to use this method. For example, an anthropologist may wish to pictorially recreate a scene from the past featuring artifacts he

has studied; or a botanist may base the description of a new genus on field notes and the study of a dried plant specimen. A photograph of such a specimen could not adequately indicate the stamens, calyx, pistils, etc. or picture the flower as it appears in life. A fossil, because of its angle of projection, size or texture may not photograph adequately for use in scientific study.

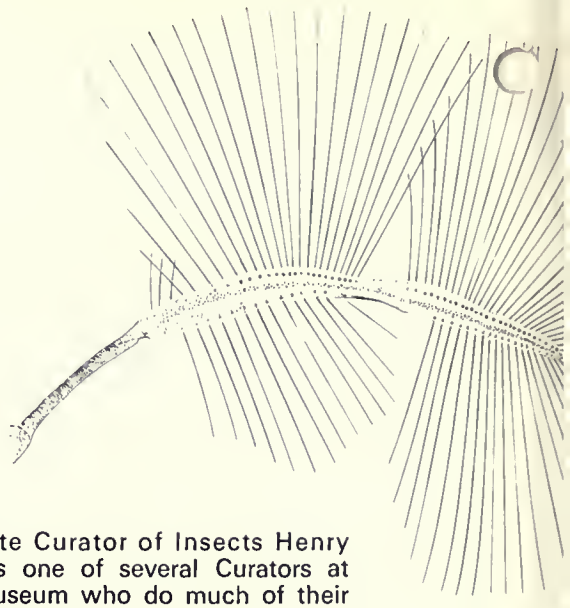
However, the Museum's Division of Photography, under the leadership of John Bayalis, has long since proven that when photographs are used they can be enormously effective. Homer Holdren, who has had wide experience as a commercial photographer, brought his own style to many *Fieldiana* plates. Whenever possible he uses light and shadow to highlight texture, brighten a luster, create interest and, always. to show a specimen to its greatest advantage.

Many of the photographs appearing in *Fieldiana*, especially those taken "on location," have been taken by the scientists themselves. When in Borneo Dr. Robert Inger, Curator, Amphibians and Reptiles, rigged up a system of lights and wires and, using infra-red film, was able to photograph nocturnal animals in their natural habitat. Dr. Louis Williams, Chief Curator, Botany, has taken hundreds of pictures of Central America—a number of which have appeared in *Fieldiana*. Loren Woods, Curator, Fishes, and his ubiquitous Minox went shutter-clicking across the Indian Ocean to return with a pictorial record of the expedition. Hymen Marx, Assistant Curator, Reptiles, has made many fine photographs of reptiles in the lab and several of these have appeared in *Fieldiana*.

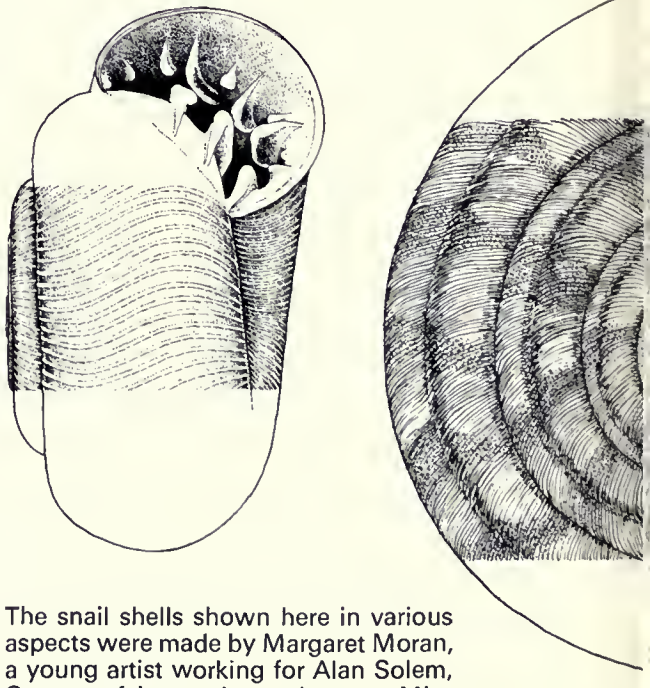
Whether drawings or photographs, the editors of *Fieldiana* have always made every effort to obtain the finest plate-making services available to do full justice to the illustrations. Finally, the printers of the Museum Press, notably William and George Sebela, a father-son team without peer in their craft, use their considerable skill to assure quality on the printed page.

It becomes evident, then, that excellence is the natural result of the care and skill spent on *Fieldiana*'s illustrations from their conception in the scientist's mind to their ultimate printed reproduction.

This month's Cover shows two drawings in wash and pencil by Douglas Tibbitts, a former Museum staff member who now does free-lance work for Emmet Blake, Curator of Birds. Tibbitts is preparing the illustrations for the *Manual of Neotropical Birds.* These drawings represent an interesting innovation in ornithological illustration. The taxonomically important details of the bird are shown in line around a portrait of the bird as it appears in life. Top drawing shows the California Quail, *Lophortyx californicus*; the lower bird is the Buff-crowned Wood-Quail, *Dendrortyx leucophrys.*



Associate Curator of Insects Henry Dybas is one of several Curators at Field Museum who do much of their own artwork. Dybas is self-taught. Shown here is a drawing of a wing from a feather-wing beetle. Dybas drew the wing magnified 100 times. Readers may recall that a photograph of a similar wing appeared on the cover of the BULLETIN in April 1966.



The snail shells shown here in various aspects were made by Margaret Moran, a young artist working for Alan Solem, Curator of Lower Invertebrates. Miss Moran's technique is so painstaking, detailed and exact, that often, as in these, only a section of the shell is shown.

John Pfiffner is a free-lance artist working with Research Curator Philip Hershkovitz on the marmosets of South America. After experimenting with other techniques, Pfiffner settled on scratchboard and pencil as the best medium for illustrating furred monkeys. Slight variations in hair patterns and colors are systematically important in South American monkeys, and scratchboard has enabled Pfiffner to detail the very minute white hairs of some animals, even against a dark skin. Along with its other virtues, the method is cheaper and faster than pen and pencil.

Davida Simon, student at University of Illinois, works for Louis Williams, Chief Curator, Botany, during her vacations preparing illustrations for *Flora of Guatemala*. Several other artists have prepared illustrations for this flora; in recent years Sam Grove, Leonore Warner and Davida Simon have been the principal contributors.

Pen and ink illustrations have some advantage over photography. Characters that the scientist wants shown can be emphasized, flower shape can be restored, and technical characters shown by enlargements.

Record Crowd

AN ATTENDANCE RECORD was set for Members' Night when 4,000 persons celebrated "an evening in Guatemala" and took a look at scientific research, at Field Museum. They heard Guatemalan music, watched the dances of the country, sipped Guatemalan punches and tasted boquitas. They also participated in a signal event of Field Museum Press—presentation of an issue in the monumental series, "Flora of Guatemala" by Chief Curator of Botany Louis O. Williams to Mrs. Catalina Contreras de Garcia, representing Guatemala, photo left.

Frank Boryca, center left, explains how plastic leaves and flowers are cast from botanical originals. Microscopes, above, tell a surprising story of reproduction in fungi, ferns and flowering plants, while a young member, left, confronts a giant Brown Bear, in taxidermy.

Enjoys Members' Night Fiesta

Guatemalan marimbist Jose Bethancourt and his orchestra send a young Guatemalan couple swinging—Leonel Alvarado from San Pedro de Laguna Atitlan and Frieda Garcia from Antigua, top photos, while, above, Botany Department "Guatemalans" Alfeida Rehling and Valerie Connor offer market candies and tropical fruits. Members, lower right, admire hand-loomed woolen blanket.

CALENDAR OF EVENTS

Museum open 9 a.m. to 6 p.m. every day; from June 24, open to 8 p.m. on Wednesday, Friday, Saturday, Sunday.

Through June 30 Exhibit: PRE-COLUMBIAN MEDICAL MINIATURES (see story below)

Through June 30 Exhibit: HANDCRAFTED GEM AND JEWELRY COMPETITIVE EXHIBITION. Sponsored by the Chicago Lapidary Club, the exhibit features more than 500 prize-winning gems and pieces of jewelry fashioned in the Chicago area.

July 6 Film for children: THE CAMBODIAN JUNGLE. Describes a small boy's life in the southeast Asian country. In the James Simpson Theatre, 10 and 11 a.m.

July 13 Film for children: A BIT OF CANADA. Previews of what can be seen on the way to *Expo '67*. James Simpson Theatre, 10 a.m. and 1 p.m.

Through August Summer Journey: ANIMAL IMMIGRANTS. A self-guided tour for young people of exhibits showing animals found in the United States but native to other countries. Direction sheets and information available at both Museum entrances and the information desk.

MEETINGS | CHICAGO SHELL CLUB, June 11, 2 p.m.
NATURE CAMERA CLUB OF CHICAGO, June 13, 7:45 p.m.

TWIN FIGURES ACQUIRED; TALK SET

Artist John Underwood shows E. Leland Webber Yoruba twin statues.

IN MAY Field Museum acquired an extensive collection of twin figures carved by the Yoruba people of Western Nigeria. The Yoruba, long noted for the complexity of their traditional technology, religion and art, used these statuettes primarily to house the spirits of deceased twins. The collection numbers sixty-nine items, including thirteen sets of twins. Mr. John Underwood, the artist, found and selected the figures during three years he spent in Nigeria making films for that nation's Ministry of Information. Field Museum will present this new acquisition to the public on July 12. The exhibition will use supplementary materials to direct attention to the ethnological and esthetic importance of the collection. In conjunction with this opening Mr. Underwood will give an illustrated lecture on the ways in which twin figures express certain principles of Yoruba art and philosophy.

MEDICAL MINIATURES ON DISPLAY

A HUNDRED pre-Columbian miniatures, on loan from New York physician Dr. Abner I. Weisman, will be on display until the end of this month in the Hall 9 Gallery of the Museum. Unearthed from tombs in Mexico and Central America, they illustrate a wide variety of medical conditions, such as headache, toothache, malnutrition, various stages of pregnancy and childbirth.

Precisely why ancient sculptors created these statues is a mystery. Some archaeologists claim they were buried as part of the personal treasure. Others, that they were designed to explain the nature of the person's illness to the gods. Dr. Weisman feels that they may have been used as teaching models by ancient physicians and surgeons.

In connection with the opening, a Symposium on "Mental Illness and Its Management in Ancient Times" was held at the Stone-Brandel Center of Chicago. Moderated by Dr. Karl Menninger, the symposium included talks by Dr. Weisman and several other experts. After the Symposium, a number of the guests came to Field Museum to view Dr. Weisman's collection.

MUSEUM REGISTRAR RETIRES

THE REGISTRAR of Field Museum is a person charged with many duties. Among other things, she must keep the master file on accessions to the collections, items ranging from sets of rare books to war canoes. She also maintains the personnel records on a staff of several hundred people, some of whom, at any given time, will be living in the Bornean jungle or in an Eskimo village, or in other odd corners of the world, beset with quite different problems.

On April 30 of this year, Miss Marion G. Gordon left Field Museum to take an early retirement. Miss Gordon, a graduate of the University of Illinois, was Registrar for 24 years, coming to the Museum as Assistant Registrar in 1943, and assuming the full duties of the office two years later. The period of her association with the Museum was one of tremendous growth for the organization and she played an integral part in handling the details and burdens resulting from the complexity and diversity of this growth. She was a key member of the administrative staff, fulfilling her many responsibilities cheerfully and effectively. Miss Gordon will be greatly missed. Her ability to answer the myriad questions and difficulties which arise in the day-to-day operation of a large Museum was important to the staff, but even more valuable was her willingness, her loyalty and her friendship. Miss Gordon has moved to Clinton, New York.

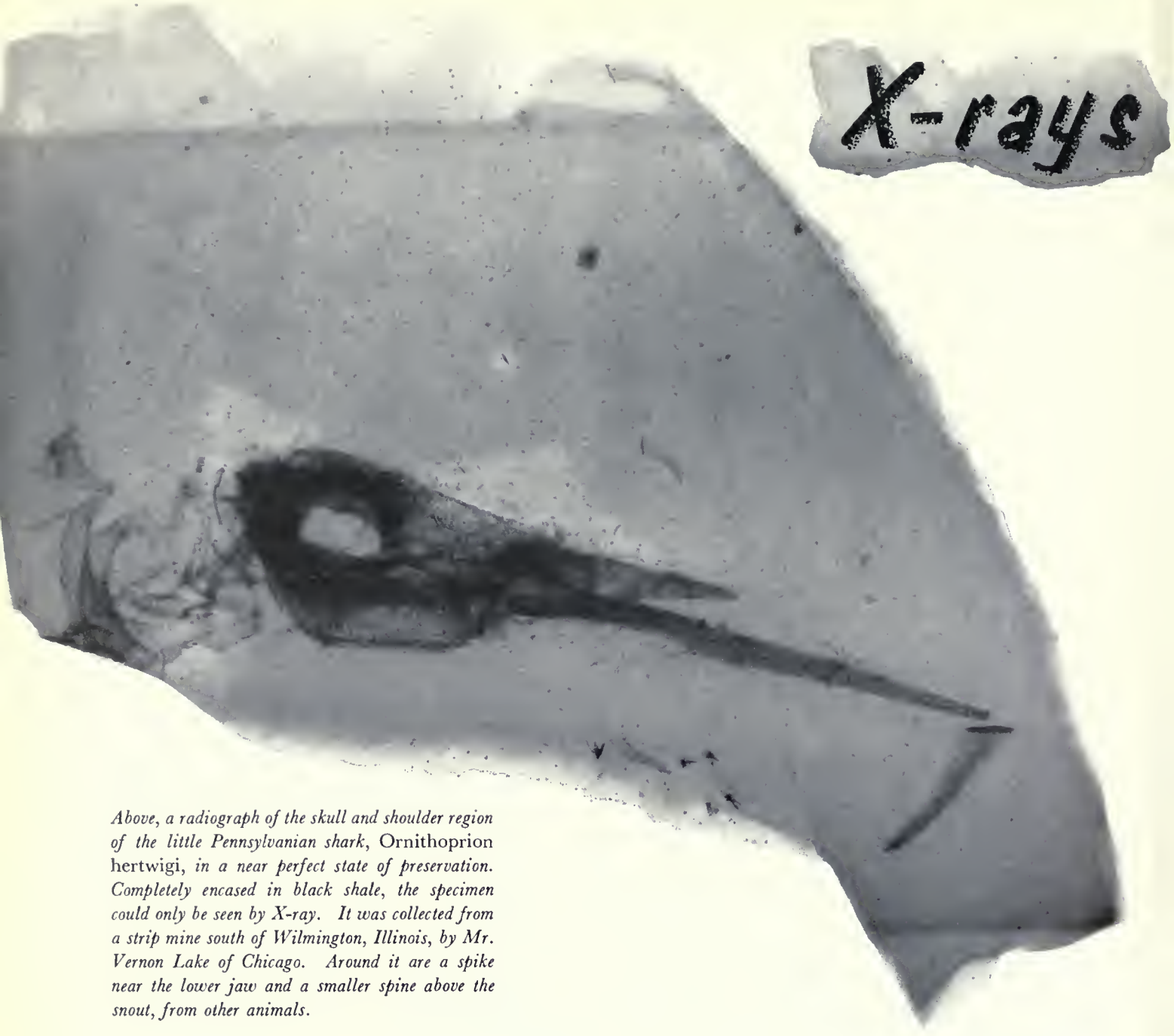
Miss Gordon's replacement as Registrar is Miss Mary A. Hagberg, who joined the staff on February 1, 1967. Miss Hagberg is a graduate of the University of Minnesota and the William Mitchell College of Law in St. Paul. Before coming to Field Museum, she served as a records analyst for Records Control Inc. of Chicago.

FIELD MUSEUM
OF NATURAL HISTORY
ROOSEVELT ROAD AT LAKE SHORE DRIVE
CHICAGO, ILLINOIS 60605 A.C. 312, 922-9410
FOUNDED BY MARSHALL FIELD, 1893
E. Leland Webber, Director
BULLETIN
Edward G. Nash, Managing Editor

BULLETIN

FIELD MUSEUM OF NATURAL HISTORY

Volume 38, Number 7 July, 1967



Above, a radiograph of the skull and shoulder region of the little Pennsylvanian shark, Ornithoprion hertwigi, *in a near perfect state of preservation. Completely encased in black shale, the specimen could only be seen by X-ray. It was collected from a strip mine south of Wilmington, Illinois, by Mr. Vernon Lake of Chicago. Around it are a spike near the lower jaw and a smaller spine above the snout, from other animals.*

radiography, a valuable research tool

X-RAYS, or Roentgenrays (after their discoverer Wilhelm Konrad von Roentgen), are invisible rays of short wavelength that have the ability to penetrate matter. Soon after their discovery, just before the close of the nineteenth century, they were tested in a variety of scientific fields for their potential usefulness in demonstrating hidden structures. For obvious reasons, intense application of radiographic techniques developed in medical diagnosis where x-rays now play a most significant role. It is rather curious to note that in other sciences where x-rays work equally well, namely, in zoology, paleontology and in petrology, radiographic techniques have not become a standard research tool and have in the past been utilized by only a rather small number of scientists throughout the world. This in spite of a few classic studies that have clearly demonstrated the merits of radiographic techniques as often superior to any others. One of the most distinguished of these is the monograph by Max Küpfer (1931) on the mode of bone formation during development in the legs of horse and donkey.

At Field Museum of Natural History, x-rays have been used for diagnostic purposes as long ago as the middle twenties, when they served the investigation of the contents of mummies. This work culminated in a monograph on "Roentgenological studies of Egyptian and Peruvian mummies" by the noted paleopathologist Roy L. Moodie (*Fieldiana: Anthropology Memoir 3*, 1931).

The equipment available was, by present standards an,

find fossils

by Rainer Zangerl, Chief Curator, Geology

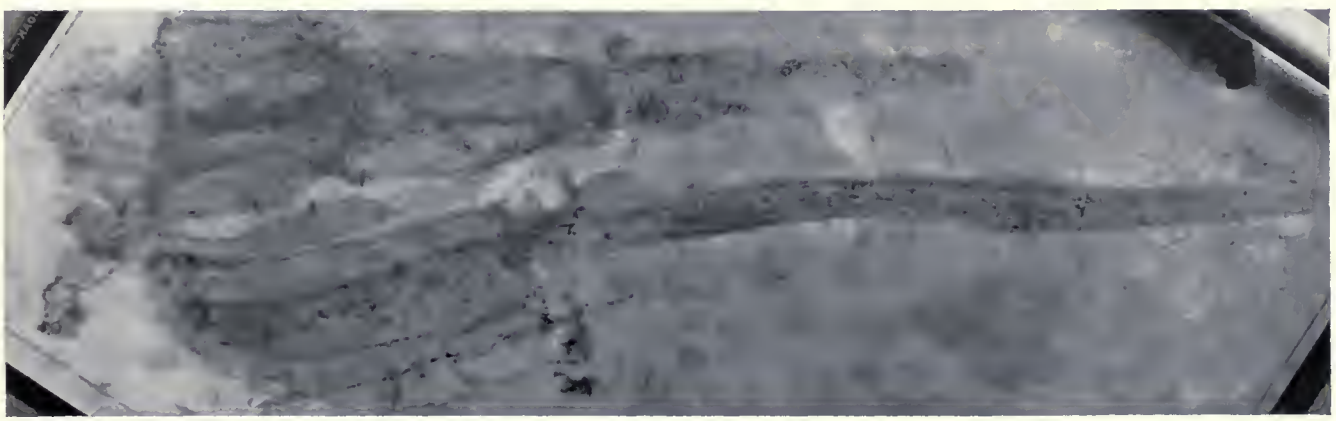
archaic machine called SNOOK that produced excellent pictures to be sure, but was extremely dangerous to operate. From about 1945 on, the machine was housed in the department of geology where it served the study of fossils. Unquestionably, the most significant and extensive use came with the Museum's Mecca and Logan Quarry project in west-central Indiana. There a fascinating fauna of sharks, palaeoniscoid fishes and acanthodians occurs in black (carbonaceous) sheety shales of Pennsylvanian age (280 million years ago). A vast number of specimens was collected from these shales, many of them representing species new to science. The investigation of these shales and their fossil content is almost wholly contingent upon the availability of x-ray equipment because the mechanical preparation of the specimens is not only extremely time-consuming, but moreover injurious to such microscopic structures as the skin denticles of sharks, and small, brittle bones and teeth. These carbonaceous shales, on the other hand, are easily penetrated by x-rays and the enclosed fossils show up very clearly as shadow pictures. Since it takes only a few minutes to make an x-ray picture, it was both necessary and possible in this case to scrutinize several hundreds of pieces of shale containing fossils.

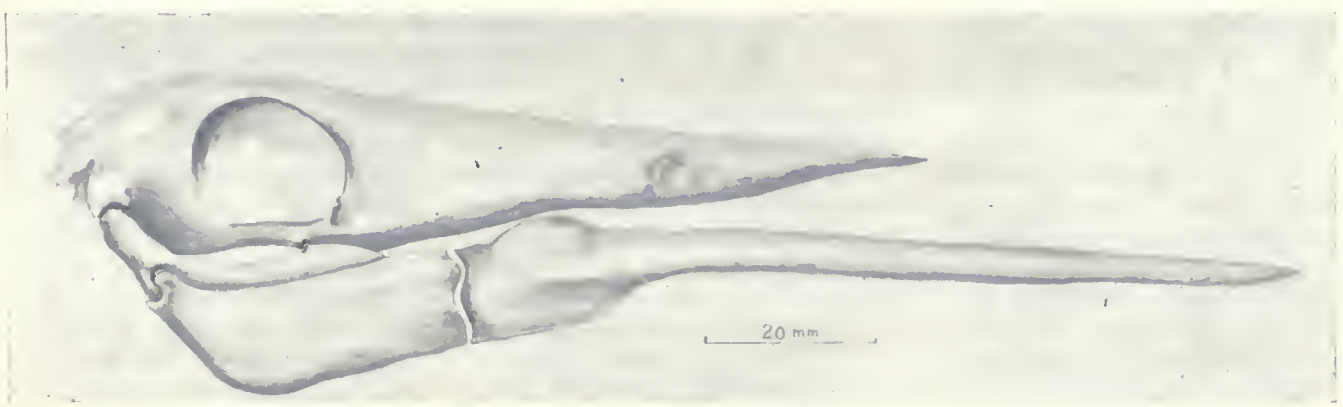
Museum Retires SNOOK

With the internal rebuilding of the Department of Geology in 1965 the old SNOOK had to be retired, since it is against state law to move and reinstall obsolete x-ray equipment. This temporarily stopped work on the Mecca–Logan fauna.

The Department of Geology is now in possession of new x-ray equipment. Through the good offices of a fellow paleontologist, Dr. W. Stürmer, a senior scientist with Siemens AG, of Erlangen, Germany, this firm's Medical Division has presented Field Museum with a HELIODOR–DUPLEX, a diagnostic x-ray machine, equipped with a Pantix tube.

The new equipment will serve several scientists on the Gology staff, but it will be the main research tool in the systematic study of the numerous species of fishes in the Mecca and Logan Quarry shales of Indiana.





Above, a positive print of a radiograph. Another specimen of the same shark, skull slightly disarticulated. Because this specimen contained little pyrite, x-rays revealed more of the major skull structures of the shark, enabling the author to produce the drawing, below, of the skull of the fish. The drawing was made by studying stereoscopic pairs of X-ray photographs, which permitted three-dimensional visualization.

the TWINS of YOR

An exhibit of wooden statues of twins opens at Field Museum, July 12. At who collected the figures, will gi

The birth of twins and their subsequent relationship to each other and to their society have always fascinated men, but nowhere has this interest been so tangibly and intensively expressed as among the Yoruba (pronounced YO-ruba) people of Western Nigeria. Our own concern with twinning lies mainly in the fields of human biology and psychology; this is expressed in research and the publication of data. The traditional Yoruba apparently did not speculate upon the nature of twins; to him they were an established fact of his religion; his concern was with their souls and it found expression in the carving and tending of images intended to enable the souls of deceased twins to stay their allotted time among men.

This sculptural aspect of Yoruba interest in twins shows an extreme development of the religious concept but does little to explain its social background or its significance for Yoruba art. In themselves these appealing wooden statuettes can do no more than to stimulate and direct lines of inquiry.

Field Museum can now provide a strategic point from which the study of twins in Yoruba religion and sculpture can proceed. In May it acquired a large collection of Yoruba twin figures which were found and selected in Nigeria during the early part of this decade by Mr. John Underwood, an English artist who was then making films for that nation's ministry of information. The collection includes sixty-eight figures, including thirteen presumptive pairs of twins.

We cannot be sure that in each instance a pair of twins is represented; although the images are almost certainly carved by the same hand, there is some possibility of figures of twins from different pairs, but made by the same carver, coming upon the market together and gaining acceptance as replicas of true siblings. For reasons to be discussed, Mr. Underwood chose not to try to buy figures from the families that owned them but instead obtained them from traders who were in a better position to know which images were dispensable. As most European buyers are not interested in the provenience or identity of twin figures, traders do not trouble to document them. Our collection therefore agrees with those of other museums in that we do not know the precise identity of the person whom the figure represents. Nevertheless, by its size and diversity Mr. Underwood's collection offers significant data for an intensifying study of Yoruba sculpture and religion.

Yoruba Culture

The study of Yoruba sculpture and religion—inseparably linked subjects—must be intensive because of the complex nature of Yoruba culture. The Yoruba are a group of peoples closely related by language, culture and history, although they do not claim a common origin. Most of them live in Western Nigeria and eastern Dahomey, in country which ranges from rain forest to open savanna. Yorubaland has about 6,000,000 inhabitants. Its population density is remarkable, ranging from 5,720 to 43,372 people per square mile. Even more remarkable is the Yoruba pattern of settlement. The Yoruba are traditionally urban, living in large towns surrounded by wide belts of farmland. Six cities have populations of over 100,000. Their urban pattern differs markedly from ours in two respects. First, the Yoruba city-dweller is also a farmer, sustained by the hoe-cultivation of such crops as yams and maize on family land outside the city. Second, the Yoruba city tends to be an agglomeration of large family units living together in compounds which in turn make up separate quarters of the city.

Some of the factors determining these conditions would be the concept of kingship and a stress upon the military expansion of the holdings of kings and their descendants. Before European administration, powerful rulers fortified their cities and attracted large populations of refugees escaping the danger and the devastation of warfare. The larger towns were somewhat on the order of "city-states" and often exerted considerable influence over outlying towns.

Many of the traditional Yoruba institutions reflect the complexity of this people's history and their remarkable urban pattern of existence. Crafts were skillfully and intensively practiced; their practitioners were often organized into guilds. Examples of weaving, dyeing, forging, brass-casting and wood-carving show a concern for excellence and originality on the part of the craftsman and sophistication on the part of the buyer. Yoruba culture strongly emphasized commerce; trade was, and still is, one of the main bases of its economic system. The Yoruba standard of living was high.

Yoruba religion is the despair of any scholar whose objective is the discovery of universal principles and a fixed inventory of tribal beliefs and rituals. Earlier authors dealt with the religion of one town or region and tended to give the impression that all Yoruba religion followed that pattern. Later studies showed a remarkable range of variation.

Certain beliefs, however, do seem to have been more or less universal in traditional times. Some of these are found also in the religious systems of peoples

BALAND

by Leon Siroto, Assistant Curator, African Ethnology

n the Yoruba people of Western Nigeria
m. that evening, Mr. John Underwood,
n illustrated lecture on Yoruba art.

adjacent to the Yoruba. The worship of certain deified ancestors, who are known as *orisha*, was common to all of the Yoruba. Although a few *orisha* are widely worshipped, the greater number are of limited distribution or only local importance. Moreover, the nature of worship differs: the cult may be individually or privately observed or it may develop into a sizeable association. The requisites for membership in a cult can differ greatly in any one town: some people have the option of inheriting the cult belonging to their family, while others may be "called" to a cult.

The *orisha* are candidly and explicitly personified deities, figures in a rich mythology quite comparable to the mythologies of Europe in its understanding of human foibles. Most *orisha* seem to be associated with specific places or waters. Some widely worshipped *orisha* are, however, associated with universal phenomena, for instance; Eshu is the *orisha* of mischief and trickery, Egun is the *orisha* of war and iron, and Shango is the *orisha* of thunder and lightning.

The Twin Cult

Distinctive customs relating to twins are observed over the greater part of Yorubaland. The Ewe peoples to the west of the Yoruba hold similar but less intensively developed beliefs. Yet we cannot deal with a Yoruba cult of twins with any great degree of assurance. In the first place we cannot be sure that the twin customs, although squarely within the field of religion, make up a cult in the sense of worshipping *orisha*, of performing primary collective rituals and of owning temples and priests. In the second place, we cannot be certain that all the Yoruba observe precisely the same usages: it would be remarkable if they did.

Some authorities have written of Ibeji, the *orisha* of twins. The Yoruba word *ibeji*, literally 'twice born,' means twin; by extension, it refers also to the images that represent twins. We cannot determine whether the Ibeji *orisha* is personified in any other form than twins and their wooden replicas. Nor can we as yet tell whether the person who treats the image of a twin according to custom does so to placate an *orisha* or the spirit, or spirits, of the twins themselves. We can find a very cursory account of a temple of the twin cult at the town of Erapo in the southwestern corner of Nigeria, but this tells us nothing of its nature, other than that it was the destination of many twins and parents of twins on pilgrimage. We read more often that the images of twins are kept in family shrines after they have served their primary ritual purpose. It seems, however, that in some cases these shrines and altars are dedicated to clear-cut *orisha* "belonging" to the family.

So far, then, we can speak of a twin cult in the sense that twins are regarded as supernatural beings and cared for with a certain amount of ritual. Even then, we do not understand precisely why twins are so highly regarded among the Yoruba, and why, of all the peoples of Africa who share this regard, the Yoruba have developed the concept to the most remarkable extent.

This development is all the more provocative when we note that the Ondo Yoruba in the southeast do not have a tradition of twin images; indeed, some authorities claim that they destroy, rather than welcome, twins. This condition may also be true of the southernmost Ekiti Yoruba, neighbors of the Ondo, who seem not to make twin images. The most frequently advanced explanation for this difference is the influence of the twin-abhorring Edo peoples—especially manifest through the former Benin empire—upon their Yoruba neighbors.

It may be that the remarkable stress placed by Yoruba upon twins is of relatively recent development. The Jekri

of the Niger delta and the Igala of the Niger-Benue confluence although separated from the Yoruba, speak languages significantly similar to theirs. They do not hold twins in any great esteem. The Jekri regarded twin births as a mishap and promptly rid themselves of the infants. One Igala group is said to have welcomed twins without reservation, but another is said to have done away with one child under the impression that its birth portended the death of a parent. In this latter case, an image of the dead twin was made and tended in the same way as the surviving twin, a custom which may be of great importance in our coming to understand the nature of the characteristic Yoruba observances.

The Yoruba believe in reincarnation: the soul of an ancestor continues to pass into the bodies of his descendants through time. This transmission is detected either through special attributes of the child or through divination. The concept often finds expression in giving the child such names as *babatunde* 'father returned' or *omotunde* 'son returned.' In the case of twins, however, there is no such reference to family souls. Their separate nature is set forth in two or three fixed names which are borne by all Yoruba twins of either sex: the first born, regarded as the younger, is called Taiwo; the following twin is called Kehinde. In certain unexplained cases a twin may be called Edun. The child who follows

Three figures from the city of Oyo, probably carved by the same group of carvers, but representing three different sets of twins. Their similarity to each other indicates that they were not intended to be faithful portraits. Height of full figures from left to right: 11½, 10½, 11¾ *inches.*

twins is usually called Idowu.

This practice of naming may imply that twins are not considered to be reincarnated members of the family but instead sojourning spirits of a higher order. This seems to be indicated by the ceremony that surrounds the birth, life and death of twins and in the claim that their advent brings good fortune. The mother of twins who have died prays that they be born to her again. Supernatural attributes are also imputed to the child who is born after the twins; one saying equates him with Eshu, the *orisha* of mischief.

We know little more about the quantity of the supernatural component of Yoruba twins than of its quality. Most authors imply that twin souls are born into twin bodies. Certain groups believe in a double creation: a soul is born on earth and its counterpart in heaven. In the case of twins, it may be that the heavenly soul comes to earth as a twin.

Whomever the soul of a twin may represent, it seems almost inseparably locked with that of its other twin. This is evident in the production and use of twin images. As far as we now know, these sculptures have no other reason to exist than the maintenance of this linkage. When twins are born, their father consults a diviner who uses the Ifa oracle to indicate the special ceremonies that the family must observe for their new twins. The suggestions offered through this procedure concern such questions as the future of the twins, their dedication to the cults of certain *orisha*, their representation by images, the foods to be prepared for their ceremonies and the special behavior of their parents in public.

Infant mortality was high in traditional Africa, and the mortality rate of twins is known to be higher than that of single births. One or both of the twins often died. In this case, the parents would have to order an image of the deceased child. This figure was probably consecrated in some way and thereafter served as the dwelling place of the soul of the dead twin.

Care of Twins

In a sense, twins are regarded as one person; they must always be treated in the same way. When they are alive, they are given the same food, the same beads and, if of the same sex, the same clothing. If one is hurt, its twin is hurt in the same place.

This equivalence is observed after the death of one or both twins. At intervals the image is symbolically fed, washed, and beautified with both pigments—indigo or European laundry blueing applied to its headdress and a red ointment of powdered camwood and palm oil rubbed on its face and body—and ornaments such as beads, shells and metal rings. These ornaments are as much intended to show esteem for the twins and pride in the family wealth as to enhance the appearance of the image. Should the surviving twin injure himself, the image of his twin is injured in the same way in the same place. If the surviving twin is given a cloth for a garment, small pieces of it are cut off to clothe the images. If this is not done, it is believed that the neglected soul will be jealous and depart, taking his twin with him. If both twins die, a mother who neglects their images risks becoming sterile.

The continual washing and feeding of the images tends to wear down the features of their faces. Figures made faceless in this way are not uncommon. In some pairs, apparently carved at the same time, the face of one image is far more worn away than that of the other indicating that one had died and the other survived or, otherwise, died much later. Why, then, the need for a ritually superfluous image of the living twin? Perhaps the images of both are carved at the same time so that the balance will not be disturbed: the soul of the living thus need not envy the soul of the dead its attractive resting-place.

The mother is charged with tending the image of the deceased twin until the survivor is old enough to take over its care. In the case of both twins dying early, the mother tends them for the rest of her life. Those who care for the images carry them to be blessed at the ceremonies of important cults or bring them together with other twin images in the family compound at special times for ceremonies said to be held primarily in the interest of twins and their parents.

This painstaking treatment seems to be more than doll-play or literal-minded observance of a dimly understood tradition. Yoruba girls have dolls which are quite different in form and meaning

Over the years after the ritual feeding and washing of the image gradually wears away its face. Twin figures wear diverse beads which proclaim wealth and cult affiliation. The face of this figure probably resembled that of right hand figure at top of next page. Height: 7¼ *inches.*

Twin figures showing the extent of regional variation. Both are from western Yorubaland. Left, 11½, a style of the Shaki region in the north; right, 9¾, the region of Abeokuta about 100 miles to the south.

from the twin figures. The guardian of the image seems to strongly feel his or her responsibility to its indwelling soul. Quite elderly Yoruba women have been seen tending the images of their twin sisters. Early in this century anthropologists succeeded in buying away such images, but only after certain rites were performed to transfer the soul into a new image. Later travellers in Yorubaland —such as Mr. Underwood—were more considerate of family affairs and obtained their twin figures through traders who obtained them mostly from Muslim and Christian converts. On the other hand, with the decline of the twin customs in the more modernized Yoruba centers, carvers, noting European interest in these easily handled epitomes of traditional sculpture, have turned to making them for sale as souvenirs.

Looking at a large number of twin images carved by one man or his followers gives us an idea of the respect that the twins' families feel for their deceased members. We also see that despite their belonging to different families, the figures resemble each other very closely. But for ornamental scar patterns, their faces are almost identical, and sometimes these patterns are the same. The images are clearly not portraits in our sense of the word, and yet they are quite recognizable to their families, to the extent that they can be used as genealogical reference points.

Upon the death of the guardian, the images are no longer carefully tended. They are still kept by the family, together with other twin images, in a special place which may be the shrine or the altar of a family *orisha*. They are apparently kept as long as circumstances permit; an example found in one Yoruba town was traced back to 110 years earlier. The twin image thus seems to undergo a functional transformation from soul-container to commemorative figure.

Although not a faithful portrait of an individual, the twin figure does have attributes which serve as makers of social status and which may be sufficient for establishing its identity within its family. Types of coiffure and beads may be said to symbolize affiliation with cults or professional groups (often the two forms of association are not distinct from each other).

The Statues as Traditional Sculpture

Even though the features of twin figures may not lead us to discover the identity of the persons they represented, they can greatly help in the identification of Yoruba carvers. These days, the study of African traditional sculpture in its original contexts must be pursued as quickly as possible; in most parts of the continent the conditions that sustained the old forms of wood-carving are changing rapidly and abruptly. The Yoruba offer the best field for the investigation of most aspects of this subject. In the sense of maintaining the framework of their traditional institutions and of adhering to their fundamental religious concepts, they are conservative. Even where they have been nominally accepted, Christianity and Islam have not replaced the traditional religion. (The persistence of the old beliefs is demonstrated by the observance of the Yoruba twin customs by Brazilians of Yoruba descent; in eastern Brazil the customs have been reinterpreted into the cult of the twin Saints, Cosmas and Damian.)

The traditional cults and customs required a sizeable inventory of carved paraphernalia. Cults in this populous land gave rise to and sustained many carvers, some of whom, although anonymous, are notable for their excellence, both in our terms and those of the Yoruba. The intensive production of sculpture occasioned considerable striving for self-expression and individuality within traditional dictates of form.

Some anthropologists believe that twin figures offer a basic field for the study of Yoruba sculpture. William Fagg, the foremost authority on Yoruba twin figures, states this point concisely: "Almost all the Yoruba have the custom of replacing dead twins by carved figures of more or less constant size (about 10 inches) and posture, and almost every Yoruba carver must have carved examples of them, thus providing closely comparable material for stylistic comparison; the range of sculptural expression achieved within the rather narrow limits of this art form is extraordinary, and the individuality of the carvers stands out all the more strikingly because of the unvarying subject matter."

Thus we can often discern quite distinct styles in the gross features of a random selection of twin figures from different parts of Yorubaland. A modest amount of documentation enables us to attribute some of these styles to certain large regions and, perhaps less often, to certain towns. The tradition of the twin figure, as Fagg has pointed out, grants

This shirt covered with cowry shells honors the twin and indicates its family's wealth: the Yoruba formerly used cowries as money. The overlapping arrangement of the shells may symbolize the twin's dedication to a certain cult. The shirt came into the collection without any figure.

the investigator a technique for more precise documentation of styles and individual carvers.

Where other sculptures are often, by virtue of their size, situation and sculptural elaboration, liable to damage and consequently to abandonment, twin figures, small and compact, are carefully kept in relatively protected situations.

Since their families regard them as individuals and thus can refer to them in genealogical reckoning, twin figures represent points in time. These points, when correlated with the work of a named carver, can indicate the development of a local or an individual style, one which could also be expressed in sculptures of major importance.

The Yoruba had many twins; statistics indicate that their proportion of twin births may be considerably greater than that of Europeans. Understandably, the twin figure is the commonest type of Yoruba sculpture. Its abundance can reveal the existence and even disclose the identity of carvers who might otherwise remain forever obscure.

This discussion of twin images should suggest the many problems posed by their form and function. Many of these problems—and certain others—are evident in Mr. Underwood's collection, since it covers a good part of the twin image-producing part of Yorubaland. Quite conceivably it may also cover a good span of time. A few of the images show such old features as the lip-plug once worn by women and the codpiece-style breeches worn by Europeans in the 16th Century. We hope to make the collection more representative through acquisition of examples of certain well-known styles from eastern and northern Yorubaland. Even as the collection now stands, students of African art and religion should welcome this large, diversified group to the Museum.

FIELD MUSEUM
OF NATURAL HISTORY
ROOSEVELT ROAD AT LAKE SHORE DRIVE
CHICAGO, ILLINOIS 60605 A.C. 312, 922-9410
FOUNDED BY MARSHALL FIELD, 1893
E. Leland Webber, Director
BULLETIN
Edward G. Nash, Managing Editor

BRENTON SAILS AGAIN

FRANCIS BRENTON, who last year singlehandedly piloted two canoes lashed together from the Colombian coast three thousand miles to Chicago and Field Museum, left early in June on an even more difficult and dangerous trip. Brenton left Diversey Harbor bound for West Africa, via the Great Lakes, the St. Lawrence and the North Atlantic. He sails in the same 26-foot dugout, the Sierra Sagrada, in which he sailed from South America last year. He has added a fiberglass-covered pontoon, a 20 horse power long-shaft motor and a fiberglass kayak, for exploring West African rivers.

He goes with a shopping list for the Museum's Department of Anthropology, which is interested in obtaining handicrafts, fishing, hunting and agricultural tools. He expects to reach St. Louis, his first port of call in Africa, on the frontier between Senegal and Mauritania, in five months. He will then head up the Senegal River in his kayak on the first leg of a tour of the West African bulge which will lead him ultimately to Timbuktu in Mali.

The final portion of his trip will be across the Atlantic to British Guiana and Brazil, and, sometime toward the end of next year, a return to Chicago.

CALENDAR OF EVENTS

Museum open 9 a.m. to 6 p.m. every day; open to 8 p.m. on Wednesday, Friday, Saturday and Sunday

July 12 through August Exhibit: YORUBA TWIN FIGURES. The Underwood Collection of twin statuettes from Nigeria. See Cover Story. Hall 9 Gallery.

July 12 Lecture: YORUBA TWIN FIGURES. Artist John Underwood speaks on the twin cult and Nigerian art at 8 p.m.

July 13 Film for children: A BIT OF CANADA. Previews of what can be seen on the way to *Expo '67*. James Simpson Theatre, 10 a.m. and 1 p.m.

July 20 Film for children: WATER FUN. James Simpson Theatre, 10 a.m. and 1 p.m.; special program for Cub Scouts at 11 a.m.

July 27 Film for children: YELLOWSTONE NATIONAL PARK AND ITS BEARS. James Simpson Theatre, 10 a.m. and 1 p.m.

August 3 Film for children: POTLATCH COUNTRY: IDAHO. A wilderness of adventure. 10 a.m. and 1 p.m. James Simpson Theatre.

August 5–27 Exhibit: THE ENIGMA OF COLORS AND PATTERNS. 31 photographs and drawings illustrate such phenomena as protective coloration and adaptation in the Animal Kingdom.

August 10 Film for children: LIVING GIANTS. The biggest living things in the world today. James Simpson Theatre, 10 a.m. and 1 p.m.

Through August Summer Journey: ANIMAL IMMIGRANTS. A self-guided tour for young people of exhibits showing animals found in the United States but native to other countries. Direction sheets and information available at both Museum entrances and the information desk.

MEETINGS | CHICAGO SHELL CLUB, July 9 and August 13, 2 p.m.

FIVE TOUR SPOTS STILL OPEN

Five openings remain on the October 27–November 12 Field Museum Tour of Guatemala, according to Phil Clark, Museum Public Relations Counsel and leader of the Tour.

The Tour, for two groups of 30 each, now has 55 registrations. It will visit Spanish Colonial towns, Indian villages and markets, ruins of Maya temples and pyramids, volcano-circled lakes, pine-covered mountains, rainforest jungles and private homes and gardens. Experts on archaeology, ethnology, botany and gardening will accompany the Tour, which will also hear Guatemalan specialists on birds and handicrafts.

Price of the Tour, all expenses included, is $1,260, including a $400 tax deductible donation to Field Museum. Information is available by writing Field Museum's Guatemala Tour, Field Museum.

PRINTED BY FIELD MUSEUM PRESS

BULLETIN **FIELD MUSEUM OF NATURAL HISTORY**
Volume 38, Number 8 August, 1967

Cabbages and Kin

by Louis O. Williams, Chief Curator, Botany

Spanish half-long radish is a root of the Earth Vegetable category, black in color and tasting like a turnip.

BOTANISTS and others who work with the systematics of plants sometimes are inclined to overlook the prosaic things that are our food plants, or even to consider them unworthy of serious study. But just consider a few food plants, and you'll see how mistaken this view is.

The mustard family of plants (*Cruciferae*) contributes a number of interesting things to our everyday diet, in addition to the ubiquitous yellow paste commonly spread on hamburgers and hotdogs. For example, Brussels sprouts is an herbage vegetable of the mustard family.

A close relative of the cabbage, Brussels sprouts goes by the botanical name *Brassica oleracea* var. *gemmifera*. *Brassica oleracea* is the common cabbage, the variety *gemmifera* is the kind of cabbage that is "bud or sprout bearing." These miniature "cabbages" of Brussels sprouts develop from axillary buds along the stem of the plant. Another characteristic of the cabbage-type vegetables in the mustard family is the cool climate they require. The Brussels sprouts plant will not develop the edible buds where the temperature average is much above 55 degrees F. In northern Europe, the climate is well suited for growing cabbage-type vegetables. As its name suggests, Brussels sprouts grows well in the climate and soil of Belgium, and it is likely the plant existed there as early as 1200. Brussels sprouts was first described in a record dated 1587, but little was known about it, even by botanists, until the 17th century. Despite its long history, Brussels sprouts is a newcomer to the dinner table. Frozen food processing has made Brussels sprouts conveniently available and greatly increased its production in the regions where it can grow.

No self-respecting food store is without Brussels sprouts in its frozen food section, yet there are many people who do not know what the plant that produces this vegetable looks like. This month's BULLETIN cover will help remedy this. It shows a model of Brussels sprouts recently completed by Mr. Frank Boryca of the Museum's Exhibition Department, placed on exhibition in the Hall of Useful Plants. The next time you come to the Museum, go to Hall 28 to see it and other plants useful to man.

Plants of economic importance, those that supply varied products that are useful to man, are a relatively small group in comparison to all the kinds of plants. There are probably no more than a dozen plants of major importance to man.

This is the stem of a Kohlrabi plant. The fleshy, edible structure develops just above the ground and has large leaves, cut off in this model, growing out of it.

The average consumer is likely to associate plants of similar usage; thus, carrots, radishes, beets and parsnips are somehow similar, since we eat their roots. Often, however, the true systematic relationships are quite different. The plant models pictured in this month's BULLETIN, *from the Museum's Hall of Useful Plants, are all crucifers, named for the cross-shaped flower common to the family.*

Certainly, the plant most useful to man is maize, and rice, wheat, the potato and beans rank high. Corn is found in more food stuffs and industrial products than any other plant.

Man is by nature a classifier, and the types of useful plants have been classified in various ways. Dr. Albert F. Hill's *Economic Botany* (McGraw-Hill, 1952) is a thorough and interesting reference book on economically valuable plants. Dr. Hill provides a simple classification of economic plants, dividing them into four major categories based on the uses they serve: Industrial Plants and Plant Products; Drug Plants and Drugs; Food Plants; and Food Adjuncts. Each one of these categories is subdivided into more specific divisions.

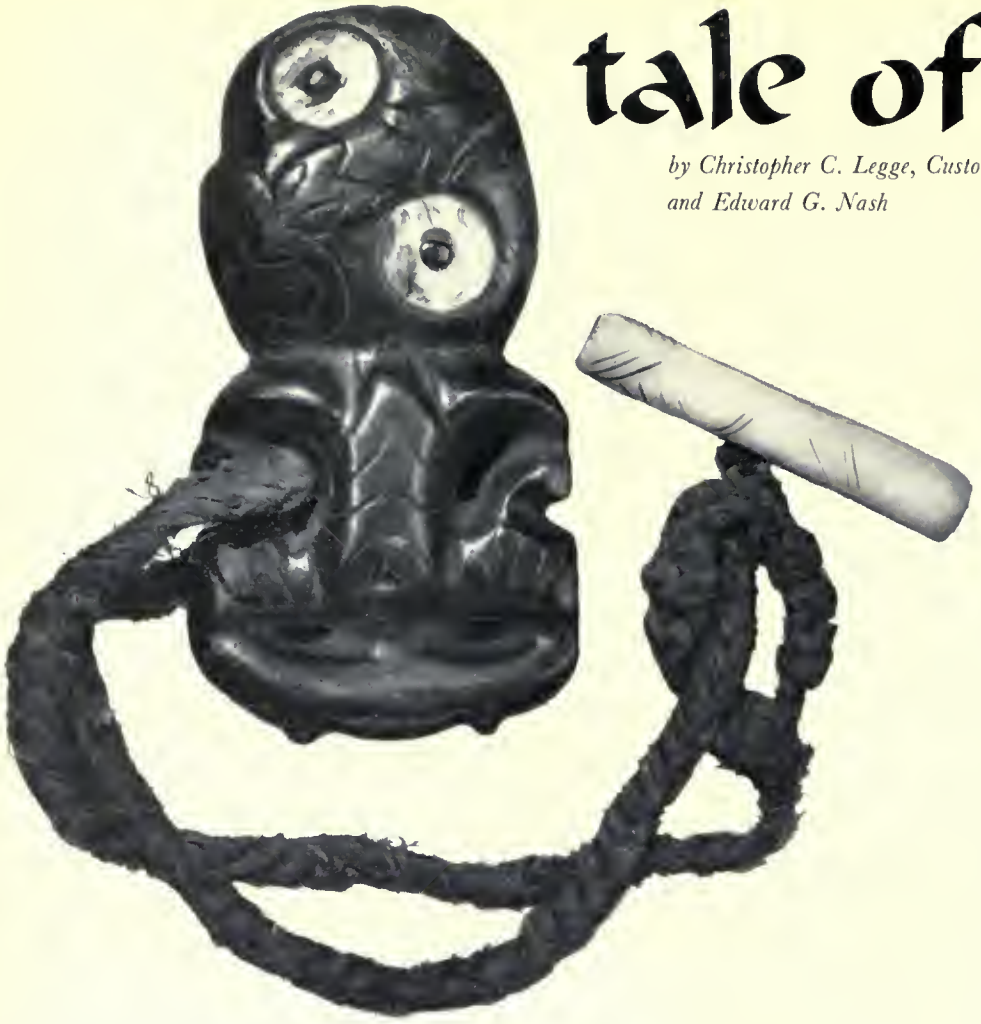
According to Dr. Hill's system of classification, Brussels sprouts falls into the group Food Plants. Dr. Hill subdivides these into the following: Major Cereals; Minor Cereals and Small Grains; Legumes and Nuts; Vegetables; Fruits of Temperate Regions; and Tropical Fruits. Turning to the Vegetables, we find that these are broken down into the following categories: Earth Vegetables, such as the potato, carrot and onion in which the food is stored in underground parts; Fruit Vegetables like tomato, avocado and eggplant which are technically fruits, but are cooked as vegetables or used raw in salad; and Herbage Vegetables like spinach, asparagus and cabbage in which the nutrients are stored above ground. Brussels sprouts and the other cabbage-types are classified among the Herbage Vegetables.

There is no clear-cut distinction between vegetables and fruits, but generally, plants or plant parts that are cooked and seasoned with salt are vegetables, and those flavored with sugar are fruits. The radish fits neither category, since it is eaten raw, but as a root, it is classed an Earth Vegetable.

Cauliflower is a Fruit Vegetable of the mustard family. Like broccoli, the modified, partly developed flower structures and stems are the edible part of the cauliflower.

tale of a TIKI

by Christopher C. Legge, Custodian of Collections, Anthropology and Edward G. Nash



THAT remarkable century, the Eighteenth, saw the beginnings of much of our modern world. The Industrial Revolution and political revolutions reshaped the social, political and physical life of Western man. The rise of scientific inquiry in the modern sense changed man's view of his universe. Natural sciences were, in effect, born during the eighteenth century as true systematic sciences. The establishment of the Linnaean system of classification (1753 for flowering plants, 1758 for animals) provided benchmarks for all later nomenclatural work on living things. The great public museums date from the eighteenth century: the British Museum was created by Parliament in 1753. Twenty years later the Vatican opened a public museum. The Louvre was established as a museum in 1793 by the French Republic. Many of these museums grew out of the collections of art, artifacts and specimens made by interested amateurs; collections which coalesced—often rather haphazardly—into the modern museums.

One such collector was Sir Ashton Lever, of Alkrington Hall, near Manchester. In 1760, Lever was reputed to have the finest aviary in the British Isles. His attention turned to fossils and shells after buying several hogsheads of shells in France. Lever finally became a human magpie, collecting all kinds of natural objects, savage costumes and weapons.

In 1774, he moved his collection from Alkrington Hall to Leicester House, London. In this stately mansion that forty years before had been the home of George II when he was Prince of Wales, Lever opened a museum which he called the *Holophusikon*, meaning that it embraced all nature. He filled 16 rooms and many passages with 26,000 items.

The *Dictionary of National Biography* says that Lever grew eccentric in dress and manner as he grew older. The assertion seems to be based on an entry in Fanny Burney's diary for December 31st 1782, when she visited the museum. She wrote, "He may be an admirable naturalist but I think that if in other matters you leave the 'ist' out you will not much wrong him." Fanny Burney went on to say that he pranced around dressed in green, with feathers in his hat, a bundle of arrows under one arm and a bow in his hand. He may not, however, have been the only man in England whose conduct was eccentric on a New Year's Eve. Moreover, Lever always had a passion for archery. When he died of apoplexy in 1788, he was sitting with the other magistrates of Manchester. He was capable of holding responsible office to the end.

At some point during the years Lever maintained his museum (1774–1785), he added to the 26,000 pieces in his collection a small *hei-tiki*, a Maori neck pendant of a female figure in green stone. Captain James Cook's second and third voyages to the South Pacific returned to England during these years, and, indeed, no other European had visited New Zealand. The tiki must have come on one of these voyages. Perhaps Cook, who undoubtedly knew Lever, presented it to him after the second voyage. But Lever acquired a large number of objects from Cook's voyages in 1781. The third expedition had returned to England in 1780 after the explorer's murder in Hawaii, and it is more probable that the piece arrived on that voyage.

Tikis were fairly common ornaments in New Zealand. Gilbert Archey in *South Sea Folk* (1949) writes, "It has been suggested that the curious shape of the hei-tiki indicated a human foetus, and that it was a fertility charm to be worn only by women, but records of early explorers show that it was commonly worn by men. Moreover, nearly all human figures in Maori wood carving have large heads and cramped limbs, and a more recent view is that the hei-tiki is a counterpart in green stone of a human figure in wood carving." Lever's tiki is four inches high and two or so wide. The detail is good, but the circular inlaid paua shell eyes look badly done, due, perhaps, to the flaking off of the upper

layers of shell. A bird bone toggle is attached to the suspension cord, which is looped through the hole between the right arm and the side of the figure.

By the early 1780's, then, the tiki had already traveled 13,000 miles. It still had some distance to go. Sir Ashton's collecting approached mania, and his fortune was sadly depleted. A Parliamentary committee praised the high quality of the collection and appraised it at 53,000£. Sir William Hamilton, whose contribution to the British naval successes of the Napoleonic Wars has never been fully acknowledged, was a member of the committee, and he considered the collection better than any he had seen on the continent. Another member, Baron Dimsdale, an early advocate of innoculation, had seen the museums at St. Petersburg and Moscow

Copyright British Museum

when he journeyed to Russia to innoculate Catherine the Great and the Grand Duke Paul against small pox. He felt that, even taken together, the two museums could not compare with Lever's. In 1783, he offered it to the British Museum for somewhat less than the appraised value. Dr. Samuel Johnson hoped that the Museum would purchase it, but the trustees declined.

A special Act of Parliament in 1785 gave Lever permission to sell his collection by public lottery. 36,000 tickets at a guinea each were printed. Unhappily, only 8,000 were sold, and Lever realized only about 8400£, less the cost of the lottery.

Mr. James Parkinson won the lottery. At the end of 1787 he moved the entire collection to the Rotunda, a building near Blackfriars Bridge, on the south bank of the Thames, erected by Parkinson for the collection. The name became Museum Leveriarum and for a number of years remained one of the sights of London. Parkinson published a series of six volumes called *Museum Leveriarum*, containing descriptions of the collection in English and Latin, with colored plates of birds, mammals and reptiles. Field Museum has a copy in its Rare Book Room.

By 1806, the Museum had become neglected; the collection was broken up into nearly 8,000 lots and auctioned off. The sale lasted two months, with a catalog running to 406 pages. William Bullock, a Liverpool jeweler, bought a number of the lots and became the owner of the tiki. He opened a museum in Liverpool and published a catalog in 1808 which described specimens from Cook's voyages and other items. About 1812, Bullock, and the tiki, returned to London. He housed his collection in the new Egyptian Hall in Piccadilly, which later became known as the London Museum. Bullock eventually turned into something of a Barnum. He bought the carriage used constantly by Napoleon from the Moscow campaign to Waterloo for 2500£. Bullock made ten times that amount by exhibiting it. In 1819, the year of Victoria's birth, Bullock sold off his collection to obtain funds for newer and gaudier projects. The tiki became lot 47, "Superb idol of jade stone from New Zealand." The tiki then disappears from the record.

Queen Victoria had been on the throne for 60 years, and the age which took her name was nearing its end when the tiki reappeared. In 1897, the contents of Hengrave Hall, a fine Tudor house at Bury St. Edmonds, Suffolk, was put up for sale by the trustees of John Lysaght. Among the many items was Lever's tiki, still carrying the label placed on it in Parkinson's London Museum: "107 Idol, New Zealand, curiously carved in beautiful nephritic stone or jade, worn round the neck. This is the largest and finest that was in the collection of the Leverian Museum."

If it had been in Hengrave Hall all those years, then it must have been purchased in 1819 by Thomas Gage, then the master of Hengrave. If it came to Hengrave later, it passed through that untraceable and amorphous link called "many other hands." A successful Ipswich dry goods man, Alfred Pretty, bought it at the Hengrave sale.

In 1913 the tiki came into the collection of the famed Oceanic collector, Captain A. W. F. Fuller and remained in his home at Tulse Hill, Surrey. In 1958, Field Museum acquired more than 5,000 specimens of Fuller's excellent collection, and the tiki crossed the Atlantic. Field Museum placed it in Hall F, devoted to Polynesia and Micronesia. And there it rests.

Leicester Square in the Eighteenth Century. Leicester House, with a small courtyard in front, is at the upper right corner of the Square. Here Sir Ashton Lever had his museum for 11 years.
Copyright London Museum.

Fall Workshops for Members' Children

AN OPPORTUNITY to meet Museum staff and work with specimens and materials from the Museum's scientific collections is again offered in a series of unique workshops open to the children and grandchildren of Members. Designed by the Raymond Foundation to stimulate and develop interest in the study of nature and man, these small group workshops, geared to different age levels, have been enthusiastically received by Museum Members and their families since they began in 1963. These Saturday programs last about one hour for the younger children and one and a half hours for the older children. Allow extra time if children are to bring specimens for identification.

Reservations are necessary, and application forms are inserted in this issue of the BULLETIN. Since it will probably not be possible to accommodate all applicants, we urge you to mail in your applications early. Please list the program, date and hour you wish, in order of preference. Each applicant will be scheduled into *one program only*, and reservations will be accepted in the order in which they are received. Applicants accepted will receive a confirmation card which will serve as an admission card to the workshop.

Make your selections and send your application now, to Raymond Foundation, Field Museum of Natural History, Roosevelt Road at Lake Shore Drive, Chicago, Illinois 60605.

September 30

Indians of Woodlands and Plains

Harriet Smith, Leader

For ages 8–10 — 10:30 A.M.
For ages 11–14 — 1:30 P.M.

Indian tribes have developed ways of life that are adapted to their environment, and they have also shown great skill in utilizing materials furnished by nature to suit man's purposes. In this workshop, youngsters will handle various naturally-occurring raw materials and see how the Indians utilized them in making tools, weapons and household equipment. Movies showing how Indian life varied in the woodlands and western plains will also be shown.

Insects

George Fricke, Leader

For ages 9–10 — 10:30 A.M.
For ages 11–12 — 1:30 P.M.

Work with Museum specimens will show structure and parts of insects. Emphasis will be on collecting, preserving and displaying insects.

October 7

Life in an Old Dead Tree

Marie Svoboda, Leader

For ages 5–7 — 10:30 A.M.
Parents are also invited. — and 1:30 P.M.

This is a special program for family groups. It will demonstrate the different kinds of animals that might make their home in an old dead tree. Such a dwelling place is picked, not for its beautiful setting or for its lovely view, but for the protection it affords.

Boneyard Menagerie

Ernest Roscoe, Leader

For ages 6–7 — 10:30 A.M. and 1:30 P.M.

This workshop will "rattle the skeletons in a few closets" by discussing the prehistoric relatives of familiar animals found in zoos and aquaria. Children should be accompanied by at least one parent. Be prepared for a few surprises!

October 14

Birds

George Fricke, Leader

For age 7 — 10:30 A.M.

Work will be done with Museum specimens to point out the parts of a bird. Emphasis will be given to attracting birds and feeding them in winter.

Insects

George Fricke, Leader

For age 8 — 1:30 P.M.

For a description of this workshop see the September 30 workshop on Insects.

Rock and Mineral Kingdom

Ernest Roscoe, Leader

For ages 10–13 — 10:30 A.M.

This is a slightly advanced program on rocks and minerals. After a talk on the qualities and characteristics for identifying different species of rocks and minerals, youngsters will be sent to the exhibition halls with question sheets to answer on their own. Children may bring their own specimens for identification.

October 21

Caveman to Civilization

Edith Fleming, Leader

For ages 10–13 — 10:30 A.M. and 1:30 P.M.

A movie on the life of the cave men, showing how they hunted prehistoric animals, opens this workshop. In the discussion and demonstration period following, boys and girls will examine real tools used by cave men thousands of years ago, learn how they were made, and compare them to tools used today.

From Fish to Man

Ernest Roscoe, Leader

For ages 10–13 — 10:30 A.M.

This workshop will trace the development of the vertebrates, animals with backbones. Starting with fish, the first members of the vertebrates, the workshop will proceed to amphibians, then reptiles, birds and the most complex vertebrates, the mammals, culminating in man.

October 28

Rockology

Ernest Roscoe, Leader

For ages 8–9 — 10:30 A.M.
Parents are also invited. — and 1:30 P.M.

For a good introduction to rocks and minerals, apply for this workshop. There will be specimens to study, demonstrations and an informative session in the exhibition halls. You can bring your own specimens for identification.

NEW MINERAL HONORS STANLEY FIELD

A NEW mineral, stanfieldite, not known in terrestrial rocks, has been discovered in the Esterville meteorite. The meteorite fell in 1879 in Emmet County, Iowa, near the town of Esterville. Several large masses totaling over 700 pounds were recovered. Specimens of this meteorite have been used for various scientific studies for several years, but this new mineral was not discovered until recently. The mineral is a phosphate of calcium, magnesium, and iron and has the chemical formula: $Ca_4Mg_3Fe_2(PO_4)_6$. Only a few grains of the mineral have been found in a piece of the meteorite 2″ x 1″ x ¾″ in size. The largest grain measures 1/25 of an inch in diameter; however, this is sufficiently large for the determination of its properties and chemical composition by modern analytical methods.

Over the years the Museum has acquired pieces of the Esterville meteorite. At the present time the Museum's holdings consist of 146 individual pieces which total twenty-one pounds.

Although meteorites are usually named after the geographical locality where they are found, new minerals found in meteorites are often named after persons who were or are prominent investigators of meteorites, or after persons who have performed other valuable services to the field of meteoritics. The mineral farringtonite, for example, was named after Dr. O. C. Farrington (1864–1933), former Curator of Geology at Field Museum. He and the late Mr. Stanley Field, former Chairman of the Board of Trustees, were largely responsible for building up the meteorite collection of the Museum to one of the world's largest by means of purchases, exchanges, and field finds. The new mineral, stanfieldite, is named in recognition of Mr. Stanley Field's participation in this achievement. When a name has been assigned to a mineral, the same name may not be used to designate another mineral. The name fieldite was used many years ago with reference to another mineral and honoring a different Field. Hence, in this case, the new mineral was named by compounding Mr. Stanley Field's first and last names. It is one of a group of rare phosphate minerals which has recently been found by the writer in several meteorites. Others are brianite (named after Dr. Brian Mason of the U. S. National Museum) and panethite (named after the late Dr. F. Paneth of the Max Planck Institute for Chemistry, Mainz, Germany).

The mineral and name have been approved by the members of the Commission on New Minerals and Mineral Names of the International Mineralogical Association. Members of this Commission voting were from the following countries: Belgium, Czechoslovakia, Bulgaria, Canada, Denmark, Egypt, Finland, France, Germany, Great Britain, Italy, Japan, Netherlands, New Zealand, Norway, Spain, U.S.A., and the U.S.S.R.

An article describing the properties and presenting the crystallographic data for stanfieldite will be submitted to a scientific journal in the near future.

—Louis H. Fuchs
Argonne National Laboratory

FAMED ARCHAEOLOGIST JOINS TOUR

One of the most prominent living specialists on Guatemalan archaeology, Dr. Edwin M. Shook, will join Dr. Donald Collier, Field Museum Chief Curator of Anthropology, in accompanying and giving expert interpretation to members of Field Museum's Guatemala Tour, October 27–November 12, it was announced recently by Phil Clark, Field Museum Public Relations Counsel and Tour Leader.

Dr. Shook, who headed the Tikal project of the University of Pennsylvania from its foundation in 1955 until 1964, is also well known for outstanding work in excavation and interpretation of the ruins of Kaminaljuyu and Iximché, included on the Tour's itinerary. He is the Executive Director of the John Lloyd Stephens Foundation, which specializes in Maya research, and has served as Archaeologist and Research Associate in Archaeology for the Carnegie Institution, as Director of the Guatemala Training Program in Archaeology of Rockefeller Foundation, as Research Staff Archaeologist for the Associated Colleges of the Midwest Central American Studies Program and as Professor at the Universidad de Costa Rica.

A few openings still exist on the October 27–November 12 Tour, according to Mr. Clark. Price of the all-expense, 16-day Tour, including a tax-deductible $400 donation to Field Museum, is $1,260. Further information may be obtained by writing Field Museum's Guatemala Tour.

Other specialists accompanying the Tour will include Dr. Antonio Molina, Field Botanist for Field Museum, of the Escuela Agrícola Panamericana, and Mr. Clark, who is a garden writer and specialist on Mexican and Central American plants; speakers will include these prominent Guatemala residents, Dr. Wilson Popenoe, horticulturist, doña Lily de Jongh Osborne, on handicrafts, Dr. Jorge Ibarra, bird specialist and Director of the National Museum of Natural History, and doña Carmen de Pettersen and don Hugh Craggs, estate owners.

Dr. Edwin M. Shook

Dr. Shook replaces Dr. Malcolm Collier, wife of Field Museum's Chief Curator of Anthropology, who was unable to accompany the Tour because of other commitments in anthropology.

CALENDAR OF EVENTS

Museum open 9 a.m. to 6 p.m. every day; open to 8 p.m. on Wednesday, Friday, Saturday and Sunday

August 5–27 Exhibit: Color and Patterns in the Animal Kingdom, A Smithsonian Traveling Exhibit. 31 photographs and drawings illustrate such phenomena as protective coloration and adaptation in the Animal Kingdom. Stanley Field Hall.

August 10 Film for children: Living Giants. The biggest living things in the world today. James Simpson Theatre, 10 a.m. and 11 a.m.

Through August Exhibit: Yoruba Twin Figures: Carvings from Nigeria. A collection of statuettes of twins made for religious and artistic purposes by the Yoruba people of Western Nigeria. Hall 9.

Through August Summer Journey: Animal Immigrants. A self-guided tour for young people of exhibits showing animals found in the United States but native to other countries. Direction sheets and information available at both Museum entrances and the information desk.

September 8–24 Exhibit: Drawings by Students of the Junior School of the Art Institute. About 50 color illustrations and constructions of Museum exhibits made by artists seven to 14 years old. Hall 9.

September Through November Fall Journey: Ancient Rome. A self-guided tour through exhibits that illustrate many aspects of daily living at the time of the Roman Empire.

MEETINGS: Shell Club, Sept. 10, 2 p.m.
Camera Club, Sept. 12, 7:45 p.m.

PREPARATOR RETIRES

After 26 years at Field Museum, Walter Reese, Preparator in the Department of Anthropology, recently retired. In 1941, Reese was apprenticed to John Anderson, carpenter in the Department, and was appointed Preparator in 1951.

A good Museum Preparator is a jack-of-all trades, and a master of many. He is intimately concerned in the preparation, planning, design, building and installation of exhibits. He works with dozens of different materials, wood, textiles, plastics, metal, and so forth. He has a good eye, a wide knowledge of the resources available, and he is clever with his hands. Walter Reese has all these abilities and more: a friendly and helpful disposition.

Mr. Reese worked in the Department of Anthropology during a period of innovation and intense activity in the exhibition program. Eight Halls were completely redone, including five American Indian Halls, Polynesia, the Hall of Primitive Art and Hall 32 South, China in Ch'ing Dynasty, and a ninth, Tibet, is well under way. The colorful, didactic style in which they were done has strongly influenced methods of exhibition in other American and many foreign museums. Reese's ingenuity played a large part in the success of these exhibits. When the Robert R. McCormick Conservation Laboratory was built in 1964, he designed and built several accessory pieces of equipment for the restoration and preservation of artifacts in the anthropology collections.

Mr. Reese's outside activities were, in part, a continuation of his work. He built the house to which he has retired, near Pentwater, Michigan, and he was involved in many do-it-yourself projects over the years, projects useful to himself, his wife, and his neighbors.

FIELD MUSEUM
OF NATURAL HISTORY
ROOSEVELT ROAD AT LAKE SHORE DRIVE
CHICAGO, ILLINOIS 60605 A.C. 312, 922-9410
FOUNDED BY MARSHALL FIELD, 1893
E. Leland Webber, Director
BULLETIN
Edward G. Nash, Managing Editor

PRINTED BY FIELD MUSEUM PRESS

BULLETIN **FIELD MUSEUM OF NATURAL HISTORY**

Volume 38, Number 9 September, 1967

underground art

by Matthew H. Nitecki, Assistant Curator of Fossil Invertebrates

The concretions shown on the cover and above were selected for their unusual and attractive shapes. In general, observers do not identify them as naturally occurring rocks. Their shapes strongly suggest that they are man-made, but in fact these specimens are claystone concretions collected in the American Northeast.

FROM TIME to time stones of unusual and attractive aspect are collected, of shapes so unusual they seem to be the product of human creative activity. Some stones are elongated, some are round and many have indescribable forms—but some, shown in the accompanying photographs, look like objects of art. Of a group of students who saw these rocks, some identified them as "primitive art, . . . fertility symbols, perhaps related to Eskimo art . . . certainly very primitive objects." Other students were certain that these rocks were "modern art." Most, however, considered them to be archaeological finds associated with early human culture.

In this light these stones, called concretions, raise a provoking problem about the definition of art, as well as a geological problem. We might think of *Art* as something that can please our esthetic tastes. Proceeding from this definition, does it make a difference what produces the object, man or natural forces, so long as the form impresses us with its beauty? Who decides what beauty is? I leave this and many other pertinent questions to the reader. . . .

Concretions are commonly found in sedimentary rocks. They are of varying composition and frequently are harder than their surrounding rock matrix. Concretions are obvious even to cursory examination, since they are more resistant to weathering and erosion and often stand out from their matrix.

The name "concretion" is derived from the Latin *concrescere*, meaning to grow together. Materials in solution inside a rock are drawn to scattered centers where they grow to form the harder discrete bodies, or concretions.

The common sedimentary rocks in which concretions are found are limestone, shale and sandstone. These consist mainly of grains of calcite, clay or quartz, which initially accumulated to form loose sediments. All the chemical and physical processes which transform these loose sediments into hard rocks are called *diagenesis*. During the time that diagenetic processes occur, a great number of phenomena takes place, including dewatering, compaction, cementation and even removal of part of the rock by subsequent solution. Rock dissolved in one area may be transported and precipitated in another area. Concretions are distinct objects because they are formed by processes different from those occurring in the surrounding sediment.

Thus, mud is transformed into shale by dewatering, compaction and little or no cementation. However, the precipitation of calcium carbonate among the clay minerals around isolated centers forms concretionary bodies which are harder than the enclosing shale. In lime muds, the precipitation of silica around nuclei results in the formation of chert or flint nodules or, in other words, concretions enclosed by limestone.

Many varied shapes and sizes of concretions exist. They may have a nucleus, commonly a fossil. When a fossil is present, it appears that the organic remains were the cause for the growth of the concretion. The familiar concretions of cherts and flints consist of fine-grained silica, generally of irregular shape. However, some beautiful spherical cherty concretions have been collected.

Concretions in many fascinating shapes are displayed in Hall 34 and at the east end of Hall 37, where fossil-like formations are distinguished from true fossils.

Concretions, common in the Illinois shales, are well known to amateur collectors and rock hunters. After being cut and polished, some specimens from the Illinois shales are, in my opinion, especially beautiful, because they have cracks filled with calcite or other minerals. Other celebrated concretions are found in the famous Mazon Creek localities in Illinois. These contain many delicately preserved ferns, horseshoe crabs, and unusual soft-bodied animals. The most unusually shaped concretions are found in glacial soils, and many of this type have been found in the state parks of northern Illinois.

The claystone concretions from Vermont, Connecticut and upper Michigan are the most eye-catching. They are a composite of small discs, formed from spheres which have coalesced in the rock. How beautiful and interesting they can be is illustrated on the cover.

Geology Tours Set For Adult Members

THE COUNTRY in and around Chicago is relatively rich in geological sites. Many interesting locations are to be found within the limits of the metropolitan area. For example, in rocks over four hundred million years old coral reefs can be seen, with the characteristic marine faunas of semi-tropical seas of Silurian times. Upon this very old bedrock the geologically young glacial sediments were deposited. The glaciers left millions of tons of unconsolidated material that formed ridges called moraines, with undrained ponds and marshes. These ridges were subsequently cut and dissected by rivers that left behind wide and flat channels.

A few miles from the great congestion of the metropolis a somewhat different geologic record can be seen. To the west the sandstone and limestones half a billion years old have been gently deformed, and thus exhibit the evidence of the enormous forces that continually change the face of the earth's crust. This spectacular fold is in the picturesque canyon of the Illinois River and its tributaries in LaSalle County.

To the south the activities of the coal miner have changed the topography of the land and laid bare the coal. This represents a remnant of a great swamp along the shore of the sea that existed in Illinois some three hundred million years ago.

Farther to the southeast there is a puzzling structure of disturbed rocks, supposed by some to have been caused by a meteoritic impact.

A series of four one-day field trips for adult Museum Members will be led by M. H. Nitecki, Assistant Curator of Fossil Invertebrates, to these areas during the Saturdays of October. The series will begin on October 7th, at 8 A.M. and the orientation meeting will be held on Saturday, September 30th at 11 A.M. Because private transportation will be used, the group will be limited in size. The trips will be free of charge. Those interested please write Raymond Foundation, Field Museum of Natural History, Roosevelt Road at Lake Shore Drive, Chicago, Illinois 60605 for an application blank. Reservations are limited in number and will be accepted in the order in which they are received. Applicants accepted will receive a confirmation card which will serve as their admission ticket.

Associate Honored by American Federation of Mineral Societies

Mr. Walter Kean, Associate in Mineralogy, has recently won the highest award obtainable in the United States for his gem cutting work. In the last few years Mr. Kean has won top awards in the Chicago area and in the Midwest Regional competitions, and this year he entered his work on a national level. At the annual convention of the American Federation of Mineral Societies, held at the Washington Hilton, Washington D. C., from June 29 to July 2nd, Mr. Kean received the trophy for the best gem faceting work in the U. S.

Field Museum is particularly fortunate in having a close association with Mr. Kean. He is currently planning some special exhibits of gem stones for the coming year.

Photo by the Prehistoric Project—Oriental Institute

Palegawra Cave, in the Piedmont Zone of northwest Iraq, in the area near Kirkuk on the map.

Bones of Palegawra

by Priscilla Turnbull

Everyone knows that anthropological expeditions are usually concerned with recovering the bits and pieces from ancient cultures. Field workers carefully collect fragments of pottery, flint tools and flakes, beads, and even cloth shreds. Human burials are painstakingly excavated and removed to a museum for study. The walls of ancient mud villages are uncovered and reconstructed, and ashes from long-cold hearths are sifted. Often the bones of animals hunted and eaten by the former residents are among the most numerous elements present. Lists of these animals associated with man's life are usually published along with the details of the excavation, particularly when the site is a prehistoric one. Occasionally, a detailed study of these bones is made, as much for its zoological importance as for the light it sheds on the past environment, and for the understanding it yields of the way of life of the ancient people.

For some time I have been involved in such a study in a field midway between paleontology and zoology, osteo-archaeology, which perfectly illustrates the interdependence of these disciplines. The materials I deal with were collected in the Near East, chiefly in Iraq, by the Oriental Institute (University of Chicago) Iraq–Jarmo Expeditions of the 1950's. These journeys were under the general direction of Dr. Robert J. Braidwood, and their purpose was to investigate and excavate the earliest settled villages known to date. The various sites—caves, rock shelters, open air, and settled villages—were inhabited during that vastly important and critical period between the end of the Pleistocene ice age and the beginning of historic time a few thousand years ago.

One of these sites, a cave known as Palegawra, has been especially important because of the large amount of bone found in it. Based on comparable horizons at Shanidar for which Carbon-14 dates exist, it has been estimated that Palegawra cave was occupied about 11,500 years ago. The cave lies in the foothills of the Zagros Mountains, northeast of Baghdad, in the Baranand Dagh, one of a series of Cretaceous anti-clinal ridges. It is a small cave, measuring about nine feet high at the mouth, with an interior 15 feet deep by 18 feet across. Palegawra's absolute elevation is 3,250 feet, and it lies about 230 feet above the valley floor. It faces south, overlooking the Bazian valley in the bottom of which a stream drains toward, but rarely reaches, a main tributary of the Tigris River.

Many people have been involved in the excavation of this little cave. Dr. Bruce Howe of Harvard University, Associate Director of the expedition, acting on behalf of the Baghdad School of the American Schools of Oriental Research, first tested Palegawra in 1951 and excavated it in 1955 with the help of Kurdish field workmen. Dr. Charles A. Reed, zoologist with the expedition, now Professor of Anthropology and Biological Sciences at the University of Illinois at Chicago Circle, visited the site during excavation and was in charge of the preparation and study of the faunal remains. I have been responsible for the laboratory study of the mammalian bones, which have now been cataloged in the Field Museum's paleontological collection in the Department of Geology. The Iraq–Jarmo Expedition had many other members—specialists in geology and botany, pottery experts, tool specialists—all involved in aspects of the expedition work. To describe, assess, and integrate the work accomplished at a score of sites will take many years and many publications.

The people who took shelter in Palegawra 11,500 years ago were hunters; they did not cultivate crops or raise domestic animals. Perhaps they followed the wandering herds of game or came into the valley occasionally seeking food. It is not likely that the cave was occupied continually for long periods of time; it is too small to be comfortable for more than a few people, and the archaeologists found no hearths that would have provided warmth in winter. Besides, the cave drips with water during rains, and winter time can be very wet indeed in northeast Iraq. The cave would offer a cool retreat from hot summer sun, however, and temporary shelter for a small group or family at any time.

The human artifacts, that is, the tools, flint projectile points, scrapers, etc., are of a microlithic type of assemblage that anthropologists term Zarzian. It is usually very difficult or impossible to identify the animals from which the bone tools are made, though I have identified beads made of incisor teeth of deer. It is the unworked but broken, charred, and gnawed bone that is of importance to this study. Probably between 5,000–10,000 bones—bits of skulls, fragments of ribs, ends of limb-bones, pieces of shoulder and hip bones, fingers, toes, and teeth—were collected from Palegawra cave and sent back to the Museum for detailed study.

There are several ways to look at collections from early man sites. The cultural anthropologist would consider the Palegawra assemblage exceedingly primitive and very an-

cient. A paleolithic specialist, on the other hand, would look upon the Palegawra tool kit as quite advanced. To one whose background has been paleontological, as mine has, the mammalian remains are entirely modern; all are from animals that exist today, or did until very recently, in the same or nearby regions. Perhaps the most peculiar aspect of this type of collection, at least to the paleontological eye, is that almost all the bones have been broken "unnaturally" as a result of man's butchering and cooking.

Examples of Palegawran equid bones, Equus hemionus. *Left side, three upper jaw fragments with several teeth in each. Right side, top to bottom, end of cannon bone (metapodial), and first, second and third toe bones (phalanges). Many of the bones were more fragmentary and less well preserved.*

Many of the bones represent the discarded parts of ancient meals. Others are from scavengers that lived and died alongside man—for example, rats and mice. Still other bone pieces were casual, chance catches; the birds and turtles, though not really game, would have added a tasty bit of variety to the diet, The work of sorting, cleaning, cataloging, and identifying the bones of Palegawra is now proceeding in the laboratories of the Museum. A large per cent of the fragments lacks diagnostic shape, edge, angle, or curve, and therefore are not identifiable at all. Nevertheless, over 4,000 Palegawran bones have been identified.

Among the game (food) mammals, bones of the onager or half-ass, *Equus hemionus*, are the most abundant in the Palegawra collection, indicating that the cave's visitors were fond of "horsemeat." Bone fragments of the large red deer, *Cervus elaphus*; wild sheep, *Ovis orientalis*; and wild goats, *Capra hircus aegagrus*, are also numerous. Bone pieces identified as belonging to the pig, *Sus scrofa*; gazelle, *Gazella subgutturosa*; and cattle, *Bos primigenius*, are also present. Rabbit, pika, fox, martin, polecat, badger and cat probably represent occasional chance food animals. Seven genera of rodents have been identified; two genera of insectivores and one bat are also recognized. Among non-mammalian animals—various birds, small land turtles, at least two genera of land snails, and fresh-water crabs—have been identified.

To the anthropologists, the relative abundance of the various animals is an indication of their economic importance to the hunters. To the zoologist, the occurrence of these animals in a prehistoric site extends our knowledge of their history. For example, the onager in Iraq has been identified in decorative motifs within historic time (much more recent than 11,500 years ago) and has been reported in herds as recently as 1927. Currently, though, it is extinct in that country. Now we know definitely that the half-ass lived in northeastern Iraq during the period between the latest Pleistocene and earliest Recent time. Three genera, the pika, *Ochotona*; the hamster, *Mesocricetus*, and the vole, *Arvicola*, were first reported among the fauna of Iraq by the Palegawra expedition. We now know they once lived in the Zagros foothills. Whether they are now extinct in Iraq, or are simply too clever to get trapped, is an open question. Nevertheless, these three animals are well known elsewhere in Asia.

Careful study of the bone fragments can correct misconceptions that have existed many years. A species of small cattle was assumed to have lived throughout the Near East in late prehistoric time. At the first casual glance, some of the Palegawra bones were identified as such a species. Detailed study, however, soon indicated that instead of small cattle, these animals were large deer. Of course, I do not know if *all* the animals that have been identified as "small cattle" in southwestern Asia are deer, but at Palegawra the evidence is irrefutable.

Consideration of the Palegawra fauna gives some strong indications about the climate and vegetation of the past. The animals identified from the bone fragments could live in a climate and setting very similar to those that exist today in the Zagros foothills. Dr. Reed believes that this area was cooler and dryer during the late prehistoric period.

Fortunately for the identification of osteo-archaeological collections, the Museum is almost unrivaled in the extent of comparative materials available. The skulls and jaws in the Mammal Division and the skeletons in the Anatomy Division are the bases on which students and I can work on "recent" fossils from ancient man's garbage dumps.

Fall Film-Lecture Series

The 1967 Fall Film-Lecture Series features the eight programs listed below. They will be held in the James Simpson Theatre of Field Museum at 2:30 P.M. on successive Saturdays beginning October 7 through November 25. Reserved seats for Museum members will be held until 2:25.

October 7 Into Siberia *Raphael Green*

Starting in Samarkand, the ancient capital of Tamerlane, this film takes you on a journey across Russia, with stops in Tashkent, the largest city of Central Asia, and other historic places. You will also see the native peoples of Siberia, the Kazakhs, Uzbeks and Tadzhiks, at work on their collective farms or textile mills and shopping in their bazaars and sidewalk stalls.

October 14

Tales of the Blue Danube

Philip Walker

All the sights along the Danube from its mouth at the Black Sea to its source in the German Black Forest, are highlighted. In the delta, you see fishing villages, and a short way upstream, Bucharest, "the Paris of East Europe." The trip also includes a visit to Sofia, the capital of Bulgaria, and Yugoslavia's capital, Belgrade. After navigating through the famous Iron Gate of the Carpathian Mountains, it's on to Hungary. High points of the film are the visit to a traditional Viennese wine restaurant and inn, and the beautiful Wachau Valley with its castles and monasteries.

October 21 Iran *Nicol Smith*

The vivid distinctions of the old and new features of Iran are emphasized in this film-lecture. Teheran's buildings and university give it the look of a modern city; the splendid ruins of Persepolis and the nearby tombs of Cyrus the Great and the Achaemenian kings epitomize the historical image of Iran. The oil fields developed in the Persian Gulf and the immense refinery at Abadan, along with the new port now under construction, Bandar Abbas, are parts of the new face of Iran. The region of Kurdistan, however, reveals the native villages that have maintained their customs and ways of living for over a thousand years.

October 28 Norse Adventure *Hjordis K. Parker*

The Viking spirit pervades this panoramic view of Norway, from Lapland to Oslo. You will see the importance of winter sports to the hearty Norwegians; hiking, mountaineering, tobogganing and most of all, skiing. The older cities still bear the mark of their Viking founders. Trondheim, established in 997 by the Vikings' first Christian King, displays its original cathedral, and Bergen, the 13th century capital, retains its medieval palace.

November 4 The Philippines *Clifford J. Kamen*

This documentary shows the rich diversity in the culture and natural wonders of the Philippines, a nation of 7,100 islands. The modern port and capital, Manila, contains the old walled city, Intramuros, and the St. Augustine Church, built in 1599 by the Spanish settlement. In the northern part of Luzon Island, you see Pagsanjan Falls and ride the rapids in a dugout. In this region also is Taal Volcano, with two concentric lakes in its crater. To the south on Cebu Island is the cross erected by Magellan on the first journey around the world.

November 11 Men Against the Ice *Bjorn Staib*

Opens with highlights of a 31-day journey across the Greenland Ice-Cap, with its treacherous blizzards and ice-crevasses. It also takes you along on an expedition to the North Pole, the most ambitious since Admiral Peary's in 1909. The documentary reveals a new type of adventure, one in which men equipped with the latest technical equipment for Arctic navigation and radio communication still must rely on their courage and ingenuity to survive the dangers of the Arctic.

November 18 Red China *Jens Bjerre*

This authentic, uncensored film-lecture shows what is going on in Red China today. It reveals as much as possible about this vast land in which one of the most dramatic revolutions in history is taking place. You'll learn about China's ancient history, the revolution and the changing life of 730 million people, one-quarter of the Earth's population. Included is an unforgettable trip from Moscow on the Great Siberian Railway across Mongolia (the Gobi Desert) to China, and you will have opportunity to follow the life of the Chinese people in the country and in the big cities; Peking, Hangchow, Shanghai, Soochow. You'll see the traces of an ancient culture in temples, palaces, old Chinese art, and one of the wonders of the world: The Great Wall. Also, the collective farms, workers-brigades, factories, schools, kindergartens, homes, beautiful landscapes and gardens. And you will witness the enormously powerful propaganda—100,000 Chinese in a political demonstration.

November 25 England and Wales

Gerald Hooper

You'll explore many places that travelers know well and a few that are far off the beaten paths in England and Wales. Included are the eminent buildings and picturesque canals of London, the Zero Meridian and Naval College in Greenwich, and at Gravesend, the burial place of Princess Pocahontas. In Wales you'll see the principality's capital, Cardiff, and Coventry, renowned for Lady Godiva's visit. Known for its roses and magnificent scenery, Wales is shown at its best in this film, particularly at the "Trooping to Colour," with all its splendor and Royal pomp.

Guatemala Tour Still Open

Field Museum's Guatemala Tour still has a very few openings before it reaches the limit number of 60 persons, according to Phil Clark, Tour Leader. The Tour, October 27 through November 12, will be broken into two groups of 30 each, once in Guatemala. It will be accompanied by experts in botany and archaeology and will take bird walks and hear talks by leading Guatemalan specialists in various fields. Besides stops at Indian villages, Spanish colonial ruins and archaeological zones, the Tour will visit private Guatemalan gardens. Price is $1260, including a $400 tax deductible donation to Field Museum. Information and reservations are available from Field Museum's Guatemala Tour, Field Museum.

BOOK REVIEW

Shell Collecting: An Illustrated History

by S. Peter Dance

There are rare occasions in literature when one book takes a field of knowledge, previously existing as unrelated trivia scattered wildly through an untold number of obscure sources, and welds these facts into a sharply delineated story. Peter Dance has done this for shell collecting. The extent of his scholarship can be appreciated by his citation of 337 references and his apology for the brevity of the bibliography. This is a book that could only have been written by utilizing the vast bibliographic sources of the British Museum and by a person with an encyclopaedic knowledge of and a profound love for the magnificent historical collections of Europe. Other people can and will amend this history in minor respects, but it will not be superseded or surpassed.

Unfortunately, this book will be little appreciated by the average shell collector. It is not a handbook for identification. It is not a manual of collecting techniques. It does not name active shell dealers or try to indicate current shell prices. It does not (except indirectly) mention scientists or scientific studies. It is not a history of malacology. It is not a book that would have been written by an American or by an amateur collector.

Simply and clearly, it is a history of shell collecting from the Roman Empire to World War I. Focusing partly on species highly prized at one time or another, partly on the curiosity cabinets of earlier centuries and partly on the great scientific collections of the 19th century, Dance presents a kaleidoscopic view of the changing fashions and values in shell collections. Since shell collecting has been connected intimately with the description of mollusks, personal glimpses of many names familiar to shell collectors—Lamarck, Bruguiére, Reeve, Sowerby, Cuming, Gray, Broderip, for example—are given and will be of interest to all. Historical recitation has not been allowed to interfere with personal opinion. Thus, some plates in one book are "shockingly engraved," a book presents "a turgid but illuminating account of the triumphs and disappointments of a shell collector in the field," and one famous book contains "nightmarish illustrations."

Perhaps the best preparation for appreciation of this book is to read the last bit of Dance's historical survey—"Today's collector is a very different character from the collector of a century ago; his collecting activities are more specialized, his collection is usually smaller and he is a better judge of good and bad material. He does not rely exclusively on auctions, dealers and personal wealth for his shells, but either collects them himself (and contributes many interesting facts useful to science in the process), or relies on the postman to bring them to him. But in one respect he differs in no way from his predecessors of a hundred or even a thousand years ago: he finds enchantment, solace or enlightenment in the contemplation and study of shells." I hope many of you will find the same in contemplation of this fascinating book.

—Alan Solem, Curator, Lower Invertebrates

LOWRY RUINS MADE NATIONAL LANDMARK

LOWRY INDIAN RUINS, located in the southwest corner of Colorado, has recently been designated a National Historic Landmark. This prehistoric village and religious center was first excavated in 1930–31 by Paul S. Martin, Chief Curator Emeritus of the Anthropology Department of Field Museum. The ruins are about 800 years old. Roof beams have been dated to 1090, and bits of evidence indicate that 50 to 60 people lived there from the middle of the 11th century until the great drought of 1276–99.

The Indian village has the remains of a three-story apartment type building constructed with various kinds of stone and brick. Martin estimates it contained from 37 to as many as 50 rooms. Many artifacts were found in the ruin, including different styles of pottery, projectile points, knives, scrapers, needles, manos and metates. Some of these are on display in the Museum's Southwest Indian Hall (Hall 7).

The University of Colorado's Anthropology Department and the Bureau of Land Management are now preparing the 3.2 acre hill-top site as a public recreation-education center.

Dr. Martin has been with the Museum since 1929. He was chief Curator of Anthropology from 1934 to 1964, when he was appointed Chief Curator Emeritus.

CALENDAR OF EVENTS

September hours: open 9 a.m. to 5 p.m. every day.

September 8–24 Exhibit: DRAWINGS BY STUDENTS OF THE JUNIOR SCHOOL OF THE ART INSTITUTE. About 50 color illustrations and constructions of Museum exhibits made by artists seven to 14 years old. Hall 9.

September Through November Fall Journey: YOUR DAY IN ANCIENT ROME. A self-guided tour through exhibits that illustrate many aspects of daily living at the time of the Roman Empire.

October 7 Film-Lecture: INTO SIBERIA. The first of the Fall Series. For details see page 6.

October 10–November 26 Exhibit: SILENT CITIES: AN ARCHITECT'S VIEW OF ANCIENT MEXICO AND THE MAYA. A display of photographs of Mexican and Mayan temples and monuments made by architect Norman Carver, Jr. Hall 9.

MEETINGS:

SHELL CLUB, Sept. 10 and Oct. 8, 2 p.m.
NATURE CAMERA CLUB, Sept. 12 and Oct. 10, 7:45 p.m.
ORCHID SOCIETY, Sept. 17, 2 p.m.
AUDUBON SOCIETY, Oct. 4, 7 p.m.

MUSEUM DONORS GET HIGHER DEDUCTION

FIELD MUSEUM has received good news from the Internal Revenue Service, a source often associated with another kind of news. By a ruling recently issued, Museum donors may give gifts which will be deductible to the extent of 30% of the donor's adjusted gross income for any given year. Heretofore, museums have not been eligible for the 30% deduction limit which had been granted a number of years ago to such organizations as universities, churches, and hospitals. The origin of this welcome legislation and subsequent ruling is President Kennedy's Tax Message to Congress of 1963. In this message he stated that the increased deduction for all charities "which are publicly supported and controlled . . . will prove advantageous to the advancement of highly desirable activities in our communities. . . ." Under resulting regulations, a tax-exempt museum is considered to be "publicly supported" if it normally receives a substantial part of its support from direct or indirect contributions from the general public or from a governmental unit.

As Field Museum turns increasingly to its members and others in the community for financial support, it will be of great importance that donors can deduct the additional 10% over and beyond the general 20% limitation on deductibility of contributions to charity.

FIELD MUSEUM OF NATURAL HISTORY
Roosevelt Rd. & Lake Shore Driva
Chicago, Illinois 60605

Founded by Marshall Field, 1893

BOARD OF TRUSTEES

Lester Armour
Harry O. Bercher
William McCormick Blair
Bowen Blair
William R. Dickinson, Jr.
Joseph N. Field
Marshall Field
Paul W. Goodrich
Clifford C. Gregg
Samuel Insull, Jr.
Henry P. Isham
Hughston M. McBain
Remick McDowell
J. Roscoe Miller
William H. Mitchell
James L. Palmer
John T. Pirie, Jr.
John Shedd Reed
John G. Searle
John M. Simpson
Gerald A. Sivage
Edward Byron Smith
William Swartchild, Jr.
Louis Ware
E. Leland Webber
J. Howard Wood

HONORARY TRUSTEE

William V. Kahler

OFFICERS

James L. Palmer, President
Clifford C. Gregg, First Vice-President
Joseph N. Field, Second Vice-President
Bowen Blair, Third Vice-President
Edward Byron Smith, Treasurer and Assistant Secretary
E. Leland Webber, Secretary

DIRECTOR OF THE MUSEUM

E. Leland Webber

CHIEF CURATORS

Donald Collier, Department of Anthropology
Louis O. Williams, Department of Botany
Rainer Zangerl, Department of Geology
Austin L. Rand Department of Zoology

BULLETIN

Edward G. Nash, Managing Editor

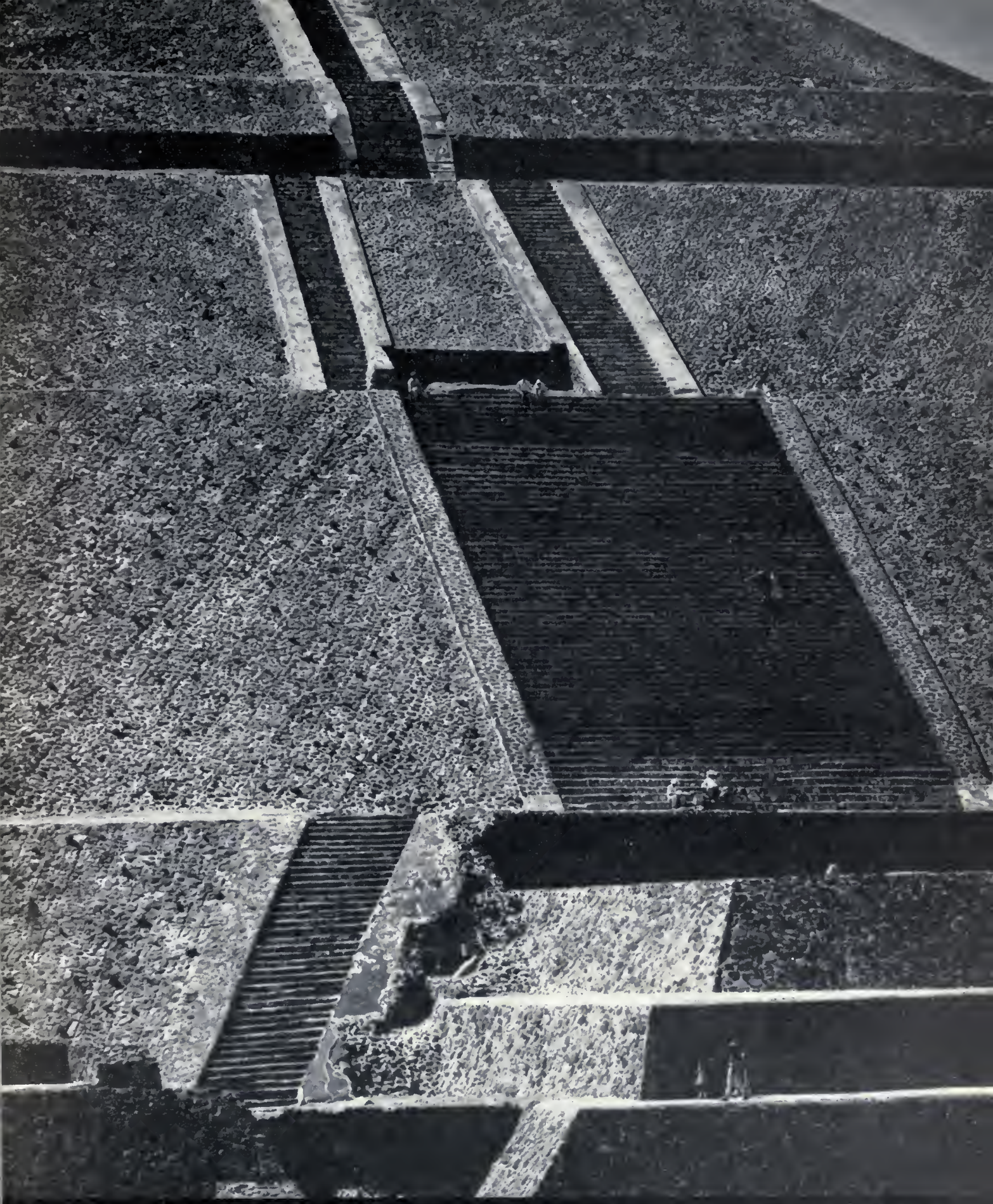
PRINTED BY FIELD MUSEUM PRESS

MEXICO

OUR COVER

The monumental mass and geometric detail of Teotihuacán's great Pyramid of the Sun are emphasized in the close-up photograph by Norman F. Carver, Jr.

On our magenta jacket, the lower section shows the Plumed Serpent, or Quetzalcoatl. This drawing was originally done in 1895 by William H. Holmes, Field Museum's first Curator of Anthropology. It is a restoration taken from the ruins of the carved stone columns Mr. Holmes studied at Chichen Itza.



BULLETIN **FIELD MUSEUM OF NATURAL HISTORY**

Volume 38, Number 10 October, 1967

SILENT CITIES

AN ARCHITECT'S VIEW OF ANCIENT MEXICO AND THE MAYA

by Norman F. Carver, Jr.

Pyramid of the Sun at TEOTIHUACAN. *A view of the central stairway is shown on the cover. This stone-faced structure 200 feet high and 700 feet on a side was the base for a temple, now disappeared. The ancient city flourished from A.D. 100 to 700 and at its height contained 50,000 to 100,000 inhabitants.*

Mr. Carver, the recipient of two Fulbright Awards, is a practicing architect in Kalamazoo, Michigan. He is also the author of the pictographic essays Form and Space of Japanese Architecture and Silent Cities: Mexico and the Maya

A photographic chronicle of ancient Mayan and Mexican architecture, based on Carver's book on that subject, will go on display in Hall 9 Gallery on October 10. Both book and exhibit developed from his conviction that the visual qualities of this architecture are too often buried in excessive archaeological and historical detail, and that the powerful forms are too often reduced to incidental aspects. The original preparation of "Silent Cities" involved more than four years of research and travel in Mexico, Guatemala and Honduras. From the hundreds of photographs made, 65 have been selected, along with 14 drawings of the sites, to illustrate 14 Pre-Columbian cities of architectural distinction.

MEXICO WITNESSED a succession of cultures spread over almost two thousand years, with each centered around a great city. The wide range of conditions in which these Mexican cities were built included the low, wet jungles of the east coast, the dry moonscape of the central plateau, and the high pleasant valleys of South Central Mexico. In spite of this range, the basic forms and techniques of Mexican culture were only slightly modified, and a remarkable unity exists over the great stretches of time and space.

Architectural form is essentially abstract, and its fundamental expressive qualities exist independent of its cultural motivations. Despite the diversity of cultures, conditions, and details, there is an underlying unity to Mexican and Mayan architecture. The functional requirements and the technological means were essentially the same.

The ancient Mexicans and Mayans lacked metal tools and the wheel, except as a toy. The materials available were stone, a type of cement and stucco. The most commonly used masonry consisted of a rough facing over a rubble core which was then finished with a heavy stucco to provide a smooth and paintable surface. The enclosure of space is the point of greatest divergence in Mexican and Mayan building. Though they have long since disappeared, wooden-roofed structures were frequently used in Mexico and Toltec Chichen Itza to span large spaces. Mayan builders, however, used wood only in lintels; consequently interiors were confined to long, narrow spaces.

MONTE ALBAN'*s commanding position on an isolated group of hills at the juncture of several fertile valleys is the reason for its occupation from prehistoric times. The central hill of the group was sculpted into an acropolis of plazas, pyramids and platforms.*

Functionally, all the "Silent Cities," with the exception of Teotihuacán, were not residential or commercial centers, but principally served as religious compounds. They were prototype cities, the ceremonial centers intended to awe and overpower the beholder. The impact of these large, brilliantly colored structures that parted the jungle or capped a plateau was a strong force in daily lives of the Mexicans and Mayans. These cities did not require the sophistication of Greek or Egyptian architecture. Splendor was paramount in the fact of their existence, and their existence required only the simplest geometry to separate them sharply from the background and everyday experience of the people. These "Silent Cities," with their imposing forms, marked a place where man appeared to control his destiny and where each generation could satisfy its wish for immortality.

In addition to the dominant temple-pyramids of obvious religious purpose, most cities included a variety of additional structures whose precise use, except for the ball courts, can only be guessed, and the names given them are merely convenient or legendary. These structures, along with the temple-pyramids, are seldom located in any discernible processional or hieratic spatial order. Rather, by their irregular multi-level placement, by their freedom from a rigid overall symmetry, the importance and individuality of each is emphasized. These separate and solid masses are the positive elements of the composition and the space becomes what is left over, what is staked out by free and emphatic forms. Within an overall assymmetry, however, individual complexes and buildings are nearly always, if loosely, axially ordered. The freedom of this local symmetry further emphasizes the self-contained quality of individual structures. The lack of overall order can partly be attributed to the growth of these cities by accretion, as over the generations buildings were added or enlarged and concepts or plans were superseded and revised.

PALENQUE *is distinguished by its carved stone and molded stucco signifying its release from heavy, monumental style.*

The PUUC *style of Mayan architecture displays a decorative motif abstracted from the tied-pole walls of the houses. Here stone masonry developed such precision it was used as veneer.*

At TULA *these Atlantean figures stand atop the Quetzalcoatl pyramid. They were once the interior supports of a walled temple.*

Only at Teotihuacán does a strong axial order, defined by the Street of the Dead, appear to have been imposed, and all subsequent building ordered by it. One can clearly see at Teotihuacán how such overall order tightens the relationship of the various structures in space, lessens their individuality and emphasizes the importance of echoing rhythms. The whole composition assumes greater importance than its parts. At Teotihuacán perhaps the original architects sensed that the scale of the Mexican landscape here demanded this vast geometry which resulted in the largest spatial composition ever conceived by man.

Since this architecture presently exists with colors faded and the stucco gone, its initial impact and monumentality is enhanced by the visible weight of stone piled upon stone—a sense of structure and process that was not conveyed in the original. The weight-destroying stucco covering meant that the impact depended on sheer size, vividness of color and articulateness of form. The development of New World architectural forms reveals an increasing concern for the nuances of their basic shapes. There is growing awareness that articu-

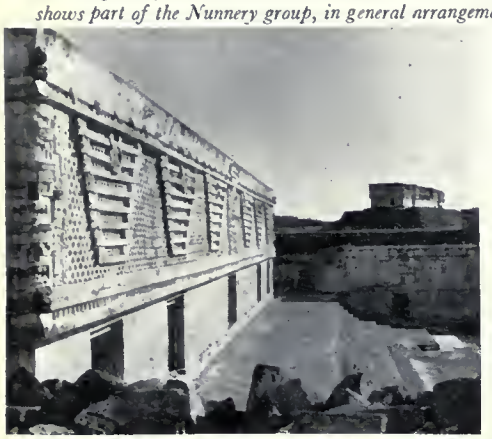
TIKAL *is the greatest Maya city. Four lofty temples, like the one shown to the left, are placed around a central plaza.*

MITLA *is unique both in the precision of its forms and the absence of monumental temple-pyramids. Here architectural elegance and control have replaced overwhelming scale as a symbol of power. In spite of their more intimate scale, though, the buildings still convey the sense of impenetrable mass.*

lated silhouette actually and mystically separates mass from environment and experience; that clearly defined and exaggerated corners strengthen the less sure lines and optically sharpen the total form; that the insistent horizontality of line, plane and shadow unify form; and that carefully proportioned and contained decoration not only astounds the eye but increases the visual separation of facade planes. It is this stepped, hovering horizontality of the facade planes and their implied mass which reintroduces a sense of weight and structural integrity. Even in the occasional use of columns, their shape and proportion to the voids continue the implied integrity of the solid facade and the impenetrability of the mass.

UXMAL's *Pyramid of the Magician.*

UXMAL *is not large, nor are its buildings particularly numerous, but their high quality and setting combine for a beautifully impressive effect. Erected in the Classic period, Uxmal is the masterwork in Mayan architecture. This photo shows part of the Nunnery group, in general arrangement and detail related to the palaces of Mitla, though considerably larger and more loosely ordered. The Nunnery was named for its resemblance to a Spanish convent. It probably served as a public forum with each building representing some element of the society.*



Dominating UXMAL *in its elevated position and majestic size is the Governor's Palace. It is the supreme achievement of Mayan architecture, the refinement of its major tenets, and perhaps the last work at Uxmal.*

Mayan traditions, which began in one of the world's rainiest regions, are initially softer and more sculptural than Mexican forms which have always had a greater precision of shape and crispness of edge, developing from the influence of the clear, dry light of the Mexican plateau. This same quality of precision increases in the Mayan work when it moves into the harsh light of Yucatan.

In Yucatan, Mayan stone masonry develops the precision that allows it to be used like finely-cut veneer. The clarity of the veneer in turn allows the stucco to be radically thinned, or in some cases, to be entirely dispensed with. Decorated facades, elsewhere soft-edged stucco, become large scale stone mosaics, and as a means of manipulating light and shade, become at once more extensive and more geometric.

The symbolic meanings of most Maya decoration are unknown, but it has several architectural effects. First, it obviously enriches large areas of otherwise blank surface and thereby provides the underlying pattern for coloration of the facades. Second, its spell-binding textures and rhythms increase the sense of monumental presence and magnificence. Third, within the limited vocabulary of Mayan architecture, changes in decoration are one of the few ways similar forms could be strongly varied. Finally, consciously or not, the slight added three-dimensionality of upper facades increases the feeling of weight and bearing on the plain base, introducing a rudimentary sense of structure to the mass.

CHICHEN ITZA, *the superbly proportioned Temple of the Warriers in its profile recalls Teotihuacan, but its serpent columns and the columned market that surrounds its base seem a duplication of Tula, the supposed Toltec capital.*

In both Mexican and Mayan architecture, the conflict between the more precise geometry implied by the masonry and the freer plasticity allowed by the stucco. Early the plastic qualities of the heavy stucco dominate and only later, as stone cutting becomes more skillful and stucco thins and articulate form becomes of greater concern, does the precision of the masonry assert itself.

FROM THE OFFICE OF THE DIRECTOR

FIELD MUSEUM
OF NATURAL HISTORY

TO MEMBERS OF FIELD MUSEUM

Field Museum's 1968 Members' Tour goes to Mexico, April 4-21. These dates include the colorful folklore of Holy Week south of the border. It is also the season when flowering trees are at their best. This tour will be slowly paced and will examine the Mexican character in many dimensions. Longer trips in Mexico will be by plane, to save time and energy for intensive study of particular regions. Short trips will be by bus, to bring the local habitats into full focus.

Specialists on Mexican plants and anthropology will accompany the group, giving talks and pointing out important details in botany, gardening, ethnology and archaeology. The country's distinctive botanical and geological zones and its principal archaeological sites will be visited.

The Tour Leader will be Phil Clark, Field Museum's Public Relations Counsel, who lived for ten years in Mexico, where he still is the garden editor for one of the newspapers. Mr. Clark has wide experience in plant study and he has authored the Mexican-published Guide to Mexican Flora. Assisting Mr. Clark as Tour Leader will be an anthropologist, still to be selected.

The 1968 Tour will follow in some distinguished Field Museum footsteps. The Museum's first major expedition, nearly 75 years ago, went to Mexico. The first Curators of Anthropology and Botany, W. H. Holmes and Dr. C. F. Millspaugh, were joined by Allison V. Armour for the trip which took them to most of the sites that the 1968 Tour will visit: Uxmal and Chichen Itza in Yucatan, Palenque in Chiapas, Monte Alban and Mitla in Oaxaca and Teotihuacán in the Valley of Mexico.

The Tour price is $975, including a tax-deductible $200 donation to Field Museum. A reservation form appears on the back cover of this Bulletin. We feel that a tour so intimately related to the work and history of Field Museum will prove not only an educational and enjoyable experience to those who take it but will also draw them closer to the life of the Museum.

Sincerely,

E. Leland Webber
Director

ROOSEVELT ROAD AT LAKE SHORE DRIVE – CHICAGO, ILLINOIS 60605 – Telephone 922-9410, Area Code 312

¡ Vamonos a México Amigo!

by Phil Clark

Photo by Mexican Tourism Council

Plumed Serpent Head grins from Quetzalcoatl Temple, Teotihuacan.

Mexico casts a unique spell—so extraordinary it can only be capsuled by a popular Mexican aphorism: *"¡Mexico, no hay dos!"* There are not two in the world, yet there are many Mexicos within Mexico—the Indian and the Spanish, the stand-pat primitive and the stridently modern, the traditional and the revolutionary, all bound together in robust, emphatic, insistent Mexicanness.

For being Mexican is like being nothing else. Where else would you find a skyscraper covered with a flame and purple mosaic of a feathered serpent? And who else would create a feathered serpent, in any age?

Yet Mexico is more than a hard Indian hand in an elaborate Spanish glove. It is an equally indigenous Nature: it is spiky century plants twisted against desert hills, or sinuous limbs of ceiba that cast bold shadows on rippling savanna grass, or scarlet salvia under the Montezuma pines high in the Sierras, or a tangle of giant leaves and flowers crowding the shores of a jungle lake. These scenes are all and equally Mexico, and all contain the color that makes magenta and orange natural partners in Mexican art; all provide the settings so boldly dramatic that pyramids like Teotihuacan, Xochicalco, Uxmal and Chichen Itza complete, not jostle, the landscape. So be prepared, on your tour April 4 to 21, to be bewitched . . .

All Tour photos by Phil Clark except when otherwise indicated.

1 *Thursday, April 4*—Fly from O'Hare Airport on one of Mexicana's new jet airliners, arriving late afternoon in Mexico City, where you inspect the Plaza of Three Cultures. The Plaza tells an abbreviated history, with its Spanish colonial church standing on the remains of an Aztec pyramid, in the midst of the ultra-modern Nonoalco–Tlatelolco housing development. You unpack in Maria Isabel Hotel, located in a quiet section of the elegant Paseo de la Reforma close to the shopping and museum centers, then attend a Welcome Dinner with mariachi music, followed by a talk on the Museo Nacional de Antropologia—one of the world s outstanding new museums.

Tlaloc, the Rain God, guards Anthropology Museum entrance

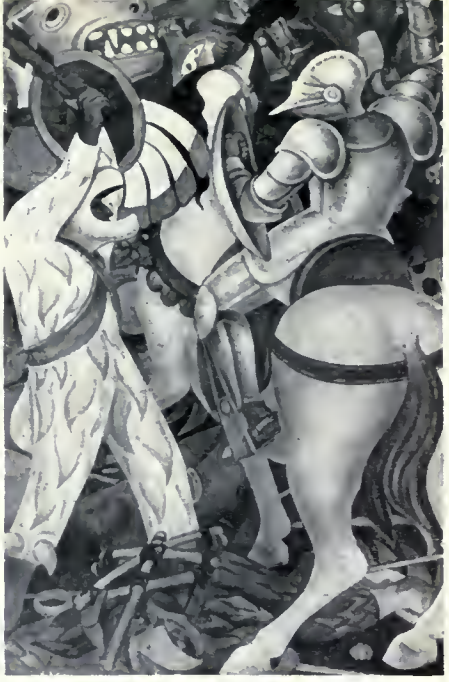
Cacti add bizarre note to the National Botanical Garden.

2 *Friday, April 5*—The story of the cloud-burst that climaxed the placement of Tlaloc, the 180-ton figure of the rain god, at the National Museum's entrance is a typical example of the way Mexico's past mingles with the present in the modern building, opened in September 1964. Your tour here begins in the Museum theater where pyramids, temples, and whole civilizations literally rise up out of the floor. The same illusion of the living past goes with you through the Museum's halls. Many of the exhibits include temples and huge monoliths, like the great Aztec calendar stone and the Olmec heads, which are arranged in the outdoor sections of the Museum. You will take the dark descent into a reconstruction of Palenque's tomb, and in the ethnology section, see life-like dancers representing the Maya, Huastec, Mixtec and Zapotec peoples. Later, in the City's exclusive Lomas section where Spanish Colonial and Mexican modern architecture uniquely blend, you visit the gardens of Bruno Pagliai and his wife, Merle Oberon, and Mr. and Mrs. Luis Menocal Jr.

Mosaiced library created by Juan O'Gorman.

3 *Saturday, April 6*—This morning you see some of the world's most original architecture at the always colorful, sometimes bizarre, campus of the National University of Mexico. Here is Juan O'Gorman's mosaic-covered library. Diego Rivera's relief murals that cover the stadium, and numerous other buildings that 180 of Mexico's leading architects and engineers erected in the 1950's. At this season, the campus is given added color by the flowering coral trees. You preview Mexico's plantlife in the University's botanical garden and recently completed orchid caves where over 800 varieties grow. You also shop in the arts and crafts market, Bazaar Sabado, then combine a picnic lunch in the lava fields with a visit to Cuicuilco, a cone-like structure that antedates the Aztec Age as much as the Aztec does ours. During the afternoon you are poled in a flower-covered boat along the ancient canals of Xochimilco . . . in the evening, entertained at Hacienda Los Morales, renowned for its singers.

4 *Palm Sunday, April 7*—You breakfast in Sanborn's House of Tiles, then visit the Church of San Francisco to observe the items of ornately woven palms on sale outside. You find Mexico's famous Ballet Folklorico is at its best in its home theater, Palacio de Bellas Artes. After the colorful performance—indigenous dances with motifs taken from all regions of Mexico—you view some of the country's greatest art work: murals by Jose Clemente Orozco, Diego Rivera, David Alfaro Siquieros and Rufino Tamayo along with paintings by Jose M. Velasco and others. In a neighborhood that purveys the Spanish Colonial charm of San Angel, you lunch, and just up the cobbled street are invited into the house and gardens of Ismael Pizarro Suarez. The next stops are in the Pedregal, at the modern house and lava rock garden of the Melvin O. Lundahls and at the vividly mosaiced house-in-a-cave of Helen and Juan O'Gorman.



Indians battle Spaniards in Diego Rivera's murals.

5 *Monday, April 8*—Just north of Mexico City you visit the first and largest city of the ancient New World, Teotihuacan, a metropolis which at its height was larger than Imperial Rome. Teotihuacan's Pyramid of the Sun, shown on the cover of this *Bulletin*, is as broad at its base as the great Egyptian Pyramid of Cheops. The ornately carved temple of the Plumed Serpent God, Quetzalcoatl, is a grand achievement in the integration of sculpture and architecture. A large portion of this ancient city, including the Street of the Dead, has been restored since 1962. On the return to Mexico City, you stop at Roman Catholicism's most important shrine in the Western hemisphere, the massive Basilica of Our Lady of Guadalupe.

Private gardens gleam with brilliant color in Mexican Capital.

Photographers delight in newly restored Temple of Mariposas, Teotihuacan.

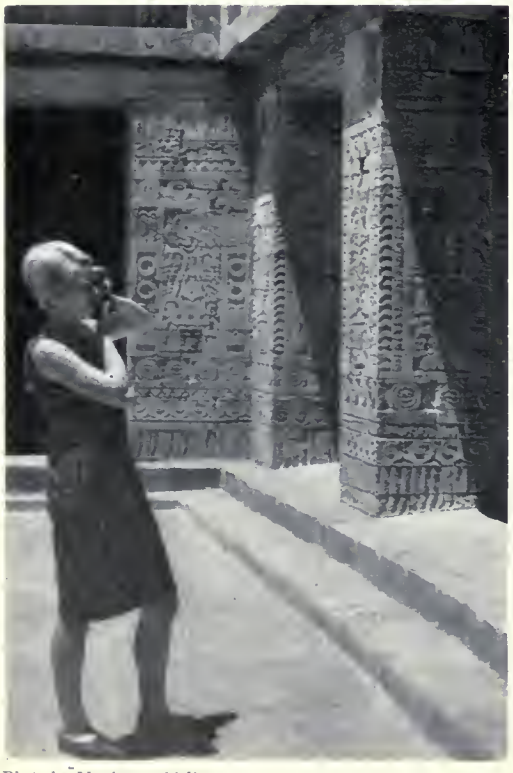


Photo by Mexicana Airlines

6 *Tuesday, April 9*—A gracious castle, once a summer palace for the Spanish Viceroys, stands on the Hill of Chapultepec. Here, in 1847 Mexican cadets fought the invading U. S. Army, and from the same heights, Empress Carlota watched Emperor Maximilian ride from the National Palace. Many of Mexico's presidents made their homes here, and now you find it brings its own rich history to light in the throne rooms, republican council halls and great historical murals, including one recently completed by Juan O'Gorman. After lunch at the hotel, you pack and set out by bus, stopping at the City's great central square to see the National Cathedral and National Palace, where Rivera painted important murals. Then you head south through pine-covered mountains to Cuernavaca. This subtropical city is, at this season, ablaze with bougainvillea and flaring masses of orange royal poincianas, with airy blue trumpets of jacaranda in contrast. Your hotel, the Casino de la Selva, is set in a tropical garden with mosaiced swimming pool and lobbies decorated by Jorge Gonzalez Camarena, Jose Reyes Meza and Francisco Icaza. The evening is for listening to the music of strolling cancioneros in the town's central plaza.

7 *Wednesday, April 10*—During the morning, you visit the Spanish Colonial house and garden of Colonel and Mrs. Pedro Chapa, who will show you their antiques and art treasures. Their garden, styled after Spanish landscapes, contains a variety of tropical plants. After lunch at the garden restaurant, Las Mananitas, you stop at the Cathedral of Morelos where Bishop Sergio Mendes Arceo, a strong supporter of the Vatican Council's Spirit of Aggiornamento, has created a powerful blend of modern and early Colonial church styles. You also view Rivera's famous murals at the Palace of Cortez.

8 *Holy Thursday, April 11*—On the way to Taxco this morning, you investigate some of the most mysterious ruins in Mexico—Xochicalco, a group of white pyramids baking in the hot, brown, desert mountains. On an isolated hilltop stands the low, profusely decorated Pyramid of the Plumed Serpent. The pyramid contains motifs typical of Teotihuacano, Toltec and Maya cultures and perhaps commemorated a conference on the calendar held by Middle American religious leaders. You stay at the Hotel Santa Prisca just off Taxco's main square where it overlooks this mountainside town of silver craftsmen, cobbled streets, ornate churches and strong traditionalist religion. In the afternoon you peruse the silver shops and by evening watch the awesome procession of thousands of men, women and children carrying candles through the winding streets. Many in the procession are masked in black, and hundreds drag heavy chains or carry crosses, often made of thorny branches weighing as much as 150 pounds, strapped to their bleeding backs. They march slowly behind images of Christ, while drums sound a funereal rhythm.

9 *Good Friday, April 12*—This morning the procession bears the figure of the Suffering Christ through the streets. An image of Saint Veronica stiffly hands the Lord the handkerchief with which, according to tradition, He wiped His face. The Three Marys, images borne from nearby churches, say farewell. Then Pilate, a living man dressed for the role, reads an official order for the crucifixion, and the people carry it out, using an image of the Crucified Christ. You return by bus to Mexico City.

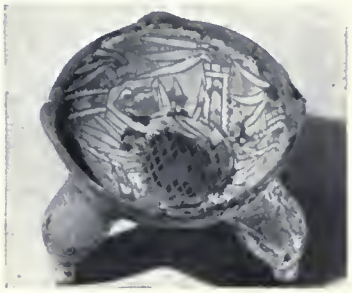
10 *Saturday the Glorious, April 13*—A morning flight takes you to Oaxaca City, where during the forenoon you see the burning of the Judases, a Saturday the Glorious tradition, and visit the market, famous for its black pottery and handloomed black and white woolen sarapes. After lunch at the garden hotel, Victoria, you drive to Monte Alban, where the ancient Oaxacans leveled off the top of the mountain and built temples and pyramids. Here are ruins ranging from the 6th century B.C. up to the 16th century.

(Continued on page 13)

recent acquisitions —anthropology

Pre-Columbian Mexican Art

RECENTLY Mr. and Mrs. Raymond J. Wielgus gave the Museum two important and beautiful works from ancient Mexico. These two specimens will go on display in October.



One of the objects is a basalt head of a boy or young man in classic Aztec style, believed to come from Texcoco in the Valley of Mexico. This sculpture, which is in excellent condition except for some battering on the nose, belongs to the somewhat rare, naturalistic strain of Aztec sculpture, characterized in representations of human figures and animals, especially dogs. In the more common type, symbolic sculpture, Aztec artists were concerned with the depiction of deities and the portrayal of religious symbolism. This head was not broken from a complete figure, but was sculpted separately, a rare occurrence in Aztec art. Judging from the style, it probably was made in the late 15th century.

The other new specimen is a rare tripod bowl, 6¼ inches in diameter, decorated in the "paint-cloisonné" technique. The designs, in six colors, show the plumed serpent in typically flamboyant Toltec style. The bowl is supposed to have been found in Teotihuacán, on the northeastern edge of the Valley of Mexico. This great city was abandoned and already in ruins by Toltec times (A.D. 900–1200), but its renown persisted and the Toltecs used it as a burial place. The specimen may well have come from a Toltec grave at Teotihuacán, though it probably was made in Western Mexico in the States of Sinaloa or Nayarit. This verdict is based on the facts that the tripod bowl is a West Mexican, not Toltec, type and that "paint-cloisonné" pottery vessels were common in Sinaloa during the Toltec period.

An unusual feature of this bowl is its two layers of decoration; a second coating of alfresco plaster, or more likely lacquer, was placed over the original lacquer-cloisonné design, much as Toltec and Aztec pyramids were remodelled and covered over periodically, perhaps at the end of a 52-year calendrical cycle. The second (outer) coating of decoration was in bad condition when Mr. Wielgus acquired the bowl. Except for a few key areas, he removed the second layer to reveal the first in its beautiful condition.

It is reasonable to speculate that the vessel was made in Sinaloa and decorated by a local artist strongly influenced by Toltec symbolism. Later it was taken to the Valley of Mexico and redecorated by a Toltec artist, less a master of the "paint-cloisonné" technique than the original artist. Finally, it was placed in a grave at Teotihuacán.

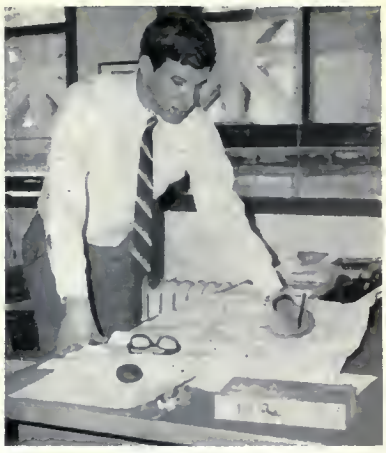
—Donald Collier, Chief Curator, Anthropology

In the Anthropology Department Charles Newlin, of Reed College, worked with the Paleolithic and Neolithic collection. Advised by Dr. Glen Cole, Chuck sorted through the drawers of stone tools which were collected for the Museum in the 1930's. Chuck measured and grouped them into such categories as hammer stones, cutting knives and other implements manufactured by the prehistoric men.

Though Chuck's major field of interest is social anthropology, he will follow up his summer's experience in Paleolithic and Neolithic anthropology with course work on these periods when he returns to Reed. Like most of the Shinner Scholars, he emphasizes the value of working with all the resources available at the Museum, the collections, curators, staff and students, as well as the library facilities.

•

Kenneth Brecher was also selected to work in the Anthropology Department, but tending the collections held little fascination for him. After working a few weeks with the American Indian artifacts collection, he created an alternate program for his Museum work. With Chief Curator Donald Collier's approval, Ken left the storage rooms to look into the Indian communities in Chicago for newly-made artifacts and Indians who could give first-hand reports on their tribal dances and crafts and personal accounts of the customs they practiced. Ken talked to many Indians and experts on American Indian culture and anthropology. He also corresponded with representatives on several reservations. This approach to American Indian studies signifies just one of the unexpected values that have come out of the Shinner Scholarship Program.



Unfortunately, Ken will not be around to carry on with the program he has suggested. Having graduated from Cornell, he will be going to Oxford this fall on a Rhodes Scholarship, where he will continue to study anthropology.

•

Alberta Blumin, a comparative literature major at the University of California at Berkeley, was given comparisons to make in another field during her summer at the Museum. From a rock pile that Dr. William Turnbull brought back from his fieldtrip to the Southwest, Alberta separated out the small black bits which will be analyzed in the search for bone fragments of the earliest mammals. Although her major field of interest did not overlap with Museum studies, Alberta had developed a fine skill last year in a paleontology course. She cleaned and prepared fossils with dental tools. This skull was an asset to her work with Dr. John Clark. For his current research she cleaned fossilized skulls and removed the lower jaws.

For Alberta, one of the most rewarding aspects of the summer at Field Museum was meeting and working jointly with the Geology staff and other students.

Interviews with some of the SHINNER SCHOLARS

During the summer, Field Museum granted 11 Shinner Scholarships to college students who are interested in Museum work. The students worked closely with their designated Curators to get some experience in the methods of museum research and collection care. Other students, in addition to those interviewed, who were awarded Shinner Scholarships include the following: Har-Kwun, of Mount Holyoke College, worked in the Botany Department; Terry Chase, of Wittenberg University, Springfield, Ohio, worked in the Geology Department; Robert Morton of Western Illinois University, worked also in Geology and Harold Stewart of Westminster College, Fulton, Missouri, worked in the Division of Insects.

Income for the Shinner Scholars comes from a grant from The Shinner Foundation. This is the second annual appropriation made to the Museum. The late Ernest Shinner was a successful south-side Chicago businessman who established this Foundation primarily to help deserving young people. The Museum Officers are grateful for the interest shown by the Foundation's Trustees: Mr. Robert F. Bradburn, Dr. William T. Carlisle and Mr. John J. Chavanne, Jr.

The Division of Reptiles was well assisted by Eric Ahlvin, a zoology student from Indiana University. One of Eric's assignments as a Shinner Scholar was to update the catalog of reprinted articles on reptiles and amphibians. Eric corrected and revised many of the old reference cards and made brief summaries of new articles he added to the catalog.

Eric is from the Chicago area, but admitted he knew very little about Field Museum until this summer. In addition to desk work and assisting Mr. Hyman Marx, Eric was sent with the Department's Research Assistant, Thomas Olechowski, to the University of Kansas to receive the Museum's recently acquired collection of reptiles and amphibians. Overall, Eric says his summer's experiences have helped him greatly to choose his field of specialization, herpetology.

●

Robert Weir applied for the Shinner Scholarship Program through the University of Montana where he is a science major. Like several others on the program, Bob was at first a bit surprised by the amount of work required to care for a collection. For example, the hundreds of fish specimens stored in jars for study reference must be dusted and refilled periodically with alcohol preservative. However, tending the collection, Bob says, became very interesting when he took advantage of this opportunity to examine the individual species and learn their names and classification. Getting acquainted with the behind-the-scenes organization of the Division of Fishes was valuable training, according to Bob. In addition, he found the reference work he did in the Museum Library for Dr. Loren Woods' forthcoming publication on fishes particularly interesting. Next summer, Bob hopes to continue working with fishes, perhaps at a marine laboratory in the Caribbean or on Cape Cod.

Christine Miller spent her summer at the Museum working in the Anthropology Department at a variety of projects. When Dr. Fred Reinman returned from Guam, Chris helped to unpack, label, sort and organize the collection he brought back. Another task in the Pacific Research Laboratory was to assist Dr. Phillip Lewis in making an IBM locator file for the Micronesian and Philippine collections.

Chris's experience at Field Museum has confirmed her intention to become a museum anthropologist. After graduating from the University of Michigan next spring, she expects to enter the new museology graduate program at the University of Wisconsin.

●

Daniel Dresner has spent his summer at the Museum at a drawing board in the Division of Birds, but no sketches of birds have emerged from his pen. Instead, Dan has been compiling a phytogeographical map of South America for a study of the birds and mammals of that continent by Curators Philip Hershkovitz and Melvin Traylor. No map of such detail, size and scope was available for study. Working from vegetation maps and from the written records made by explorers, Dan has done a great deal of research and all the execution on this map which locates ten different types of vegetation in South America. For his information, he had to turn to sources written in Spanish, Portuguese, French and German, as well as English.

Dan is currently a student in Biology at Roosevelt University. Since most of Dan's previous research has been with living animals, the study of vegetation to determine what types of birds might survive in the different regions has been an interesting methodological discovery. When asked if the study of South America has roused his interest to visit there, Dan answered . . . "I've been wanting to go there all summer."

MUSEUM HONORS FORMER CURATOR

On October 10, the Museum will make a special award to J. Eric S. Thompson, the distinguished Maya Scholar in celebration of the 40th anniversary of the first publication by Field Museum of his book *The Civilization of the Mayas*. There are now over 25,000 copies of this work in print, and it is in its sixth edition. The award will be made at a luncheon given in Mr. Thompson's honor by the Women's Board. Other guests will include his son, Donald E. Thompson, several of Mr. Thompson's colleagues in Maya archaeology, and Mr. Norman F. Carver, Jr., who made the photographs in the exhibition "Silent Cities: An Architect's View of Ancient Mexico and the Maya," opening that day.

Eric Thompson is an Englishman, educated at Cambridge University. He was Assistant Curator of Central and South American Archaeology at Field Museum from 1926 to 1935. During this period he went on six Museum expeditions to Mexico, Guatemala and British Honduras and published, in addition to *Civilization of the Mayas*, a number of important papers and monographs in the Museum's Anthropology Series. His field work was centered mainly in British Honduras, where he studied and excavated numerous Maya sites and investigated the culture of the contemporary Mayas. A major part of the Museum's Mayan archaeological and ethnographic material was collected on these expeditions. His most famous paper published by the Museum (1927) is entitled "A Correlation of the Mayan and European Calendars." The most widely accepted correlation today is known as the Goodman–Thompson correlation. His life work on Maya hieroglyphs is summed up in *Maya Hieroglyphic Writing: An Introduction*, published by the Carnegie Institution of Washington in 1950 and in 1960 put out in its second edition by the University of Oklahoma.

In 1955 Mr. Thompson joined the staff of the Carnegie Institution, where he continued his Maya studies until 1957. He now lives in "retirement" in the Essex village of Ashdon, not far from his colleagues and friends at Cambridge University. There, surrounded by his superb library on the Mayas and their Middle American neighbors, he continues to turn out scholarly papers at an unabated rate.

CALENDAR OF EVENTS

October hours: Open from 9 a.m. to 5 p.m. every day.

October through November Fall Journey: Your Day in Ancient Rome. A self-guided tour through exhibits that illustrate many aspects of daily living at the time of the Roman Empire.

October 7 Film-Lecture: Into Siberia. 2:30 p.m. in the Museum's James Simpson Theatre. Lecturer Raphael Green, of the University of Minnesota, illustrates his talk with a color film of this vast, little known region.

October 10 – November 26 Exhibit: Silent Cities: An Architect's View of Ancient Mexico and the Maya. For details see page 2.

October 18 New Acquisition: Pre-Columbian Mexican Art. Two new pieces donated by Mr. and Mrs. Raymond J. Wielgus. Stanley Field Hall. For details, see page 9.

MEETINGS:

Audubon Society, Oct. 8 and Nov. 5, 7 p.m.
Shell Club, Oct. 8 and Nov. 12, 2 p.m.
Nature Camera Club, Oct. 10, 7:45 p.m.
Orchid Society, Oct. 15, 2 p.m.

CLARENCE B. RANDALL 1891-1967

With the death of Clarence B. Randall on August 4, Field Museum lost one of its most admired friends and associates. Mr. Randall, a Trustee of the Museum from 1946 to 1961, had three distinguished careers in his active lifetime, as businessman, governmental advisor and author. He first came to Inland Steel in 1925, and rose to be president from 1949 to 1953 and chairman from 1953 to 1956. He was nationally known as spokesman for the steel industry, and, in President Kennedy's words, as "a forceful and articulate philosopher of the role of business in a free society." On his retirement in 1956 at the age of 65, Mr. Randall was made special advisor to President Eisenhower on foreign economic policy and served with distinction under Eisenhower and his successors, Presidents Kennedy and Johnson. He was author of several books on business philosophy, and in 1956 published his own reminiscences, *Over My Shoulder*.

Mr. Randall's association with the Museum was not only an expression of his interest in public service, but of his love of nature. He was, as he put it himself, "a pot hunter turned birder turned photographer," and throughout his busy career he managed to find time to enjoy these pastimes. As those who have seen his pictures well know, he brought the same competence to his photography that he showed in all his work.

FIELD MUSEUM
OF NATURAL HISTORY
ROOSEVELT ROAD AT LAKE SHORE DRIVE
CHICAGO, ILLINOIS 60605 A.C. 312, 922-9410
FOUNDED BY MARSHALL FIELD, 1893
E. Leland Webber, Director
BULLETIN
Edward G. Nash, Managing Editor

PRINTED BY FIELD MUSEUM PRESS

11 *Easter, April 14*—You may attend Mass at the richly designed Spanish Colonial Church of Santo Domingo and view its great Colonial paintings and sculptures. Later, at the State Museum, where you see jewelry from Tomb Seven, Monte Alban, the sophistication of the Zapotec and Mixtec cultures is revealed to you. In the afternoon, you explore the ruins of Mitla, 18 miles southeast of Oaxaca. Particularly beautiful are the complex spiral fret patterns of the Hall of Mosaics. From Mitla, it is a short drive to Santa Maria del Tule to see its Montezuma cypress—160 feet around and 165 feet tall—estimated to be thousands of years old.

12 *Monday, April 15*—You fly to Villahermosa, Tabasco, in the tropical lowlands. With lunch at the Hotel Manzur, you then tour the unique Park Museum. Archaeological exhibits are in a lush setting of botanical garden and zoological park. The mysterious Olmec heads and carved altars are considered the works of the mother-culture of Mexico's pre-Hispanic civilizations.

13 *Tuesday, April 16*—You ride by bus through tropical savanna and forest to the ruins of Palenque, in the State of Chiapas. Here, with a backdrop of jungled mountains, you explore the tomb in the Temple of Inscriptions, the Palace with its relief carvings and other pyramids and temples. This center of ruins has been described by many archaeologists and travelers as the most beautiful of the Maya sites.

Mixtec Indian woman sells pottery in Oaxaca market.

Photos on back cover: *Artisan paints pottery cat, Cancionero and guitar, Relief mural by David Alfaro Siqueiros—photo by Homer Holdren, Coral tree's scarlet flower, Holy Thursday in Taxco—photo by Juan Estrada.*

14-15 *Wednesday–Thursday, April 17–18*—You visit the Villahermosa Museum, then take a flight to Merida, Yucatan and a bus from Merida to Uxmal, where you spend the afternoon and most of the following day at the ruins. The earliest temples and pyramids of this great Maya city were built during the 13th century. Much local handicraft is available at your hotel, the Hacienda Uxmal.

Photos by Juan Estrada

Holy Thursday Procession builds to a climax amid slow drum beats, penitents and their burdens of thorn branches and the reverently borne figure of the Crucified Christ.

16 *Friday, April 19*—You ride by bus to the ruins of Chichen Itza, with lunch at the Hotel Mayaland. During the afternoon you tour this, the best preserved archaeological site in the Maya area. Particularly impressive is the Temple of the Thousand Columns, with its limestone relief carvings of warriors and its dramatic plumed serpents. Highlights are the ballcourt, the enigmatic Chac-Mool and the sacred well in which Maya maidens were sacrificed.

17 *Saturday, April 20*—You continue your exploration of the ruins. After lunch at the Hotel Mayaland, you ride into Merida, to view the central square and the Casa Montejo. By plane you return to Mexico City for a farewell dinner at the Hotel Tecali with its terrace views of the great city at night.

18 *Sunday, April 21*—You return to Chicago on a morning Mexicana flight, with arrival in the early afternoon.

make your reservations NOW

for FIELD MUSEUM'S MEXICAN TOUR

April 4 to 21

be in Taxco for the awesome Holy Thursday processions, visit the impressive ruins of the Aztecs and Teotihuacanos, the Zapotecs and Mayas, see tropics and highlands during flowering trees' season, be entertained in important private homes and gardens, tour the great museums, keep abreast of trends in art and architecture, shop in native markets, travel with specialists in Mexican plants and gardening and in Mexican archaeology and folk history

ONLY $975 INCLUDING A $200 TAX DEDUCTIBLE DONATION TO FIELD MUSEUM

(also covers all costs -- hotels, meals, gratuities, taxes and fees, guides, transportation and baggage handling)

act now -- the number of reservations is limited

CLIP AND MAIL THIS COUPON **TODAY**

I would like..... reservations for your Mexican Tour and I enclose my check
(HOW MANY)
for a $200 deposit for each reservation

Name .....

Address .....

City ..... State ..... Zip .....

☐ Please check if single rooms are desired, at extra charge.

Please send information about this tour to my friends listed below:

Name .....

Address .....

City ..... State ..... Zip .....

Name .....

Address .....

City ..... State ..... Zip .....

BULLETIN **FIELD MUSEUM OF NATURAL HISTORY**

Volume 38, Number 11 November, 1967

The two careers of Fritz Haas

by Alan Solem, Curator, Lower Invertebrates

On October 20, 1908, the fourth number in the fortieth volume of the *Nachrichtsblatt der Deutschen Malakozoologischen Gesellschaft* was issued in Frankfurt-am-Main. Among the many technical reports, there were three short papers on fresh-water clams written by a young German zoologist, Fritz Haas. Since the preceding year, at the suggestion of Wilhelm Kobelt, he had been studying the variation and ecology of unionid clams in the Upper Rhine basin.

Now, at the start of his sixtieth year as a publishing scientist, it is appropriate to review and summarize his career. As these words were being written, Fritz Haas was reading galley and page proof of two much longer papers. One summarizes the living and fossil genera of unionid clams for the "Bivalvia" section in the *Treatise on Invertebrate Palaeontology*. It numbers only a few hundred manuscript pages. The other is a synopsis for "Das Tierreich" covering all living species of unionid clams. It comprises about 1,000 typed pages. Either monograph would be a major contribution from any systematist. Both were written by Fritz Haas considerably after the normal retirement age of 65.

The bare statistics of his career are impressive—a bibliography with 319 entries and a list of 385 new genera and species produced over six decades. Very few scholars compile such a record, but Fritz Haas will be remembered longest, not for the number of papers he wrote, nor for the many taxa he described, but for the major synthetic papers he published and the many more "species" that he reduced to synonymy. His 1940 revision "A tentative classification of the Palearctic Unionids" grouped 1,309 described forms of unionid clams into only 19 species, with 65 geographic races. The "Bivalvia" section in Bronn's *Klassen und Ordnungen des Tierreichs* (1929–1956), "Die Unioniden" in Martini–Chemnitz (1910–1919), the series of papers on Spanish mollusks co-authored with Arturo Bofill (1919–1921), the "Lamellibranchia" section in *Die Tierwelt der Nord- und Ostsee* (1926), "Fauna Malacológica Cataluña" (1929), "Bau und Bildung des Perlen" (1931), and his two latest synoptic studies on the unionids will assure his place in the history of malacology, even without the many descriptions of new taxa.

Born January 4, 1886, the youngest of four children in a Frankfurt banker's family, Fritz was a naturalist from childhood. Early interests in insects and geological specimens were transferred to mollusks through the influence of his Gymnasium teacher, Oscar Boettger, a famous malacologist and herpetologist, then near the end of a long and illustrious career. Through Oscar Boettger, the young Haas met and worked with Wilhelm Kobelt. Both men had a profound influence on his subsequent career. Meticulous descriptions and well chosen illustrations characterize Haas' papers, and his early descriptions follow the pattern used by Boettger. Haas' continuing interest in the unionid clams, his grasp of ecology and his great interest in zoogeography, all came from early association with Kobelt.

In this day of population biology and the application of evolutionary theory to systematics, it is difficult to realize the status of molluscan taxonomy during the early 1900's. As nineteenth century Europe had been torn and divided by the Napoleonic and Franco–Prussian wars, so malacology had become divided into opposed camps. Starting in the 1870's, under the leadership of Bourguignat, workers in France and Italy began describing, literally by the hundreds, "species" of land and fresh-water mollusks. Their "*nouvelle école*" totally ignored factors of the soft anatomy, phenotypic and intrapopulational variation, geography, hinge structure, and shell sculpture in the unionids. They used a completely typological approach, relying on a few gross shell measurements and simple ratios to discriminate their "species." Carried to its logical extreme, almost every specimen became a "species." The influence of this school still haunts systematic malacology, since it is far simpler to propose new names than to prove that named forms are minor variations of biological species.

Even at the height of Bourguignat's influence, many malacologists did not accept his premises. In France, Drouët and the Fischer family, in Germany Kobelt and the Boettgers, most of the English, American and Scandinavian workers began to grope toward an understanding of geographic and phenotypic variation. Kobelt focused attention on the probable importance of hydrographic boundaries and local variation in unionid evolution, but he was too old for the intensive field work and collection study required. Fritz Haas provided the evidence and hard work needed to confirm Kobelt's inspired hypotheses.

Two surprises greeted Fritz on October 20th. First was the publication of *Fieldiana: Zoology, Volume 53, Number 2,* "New Molluscan Taxa and Scientific Writings of Fritz Haas," a complete list of his publications and new molluscan names. This will be an invaluable bibliographic aid to malacologists of this and succeeding generations.

Although Boettger and Kobelt were primarily responsible for the form and substance of Fritz Haas' work, his Ph.D. was obtained under the direction of Prof. Buetschli at Heidelberg. A source of quiet pride to Fritz was the receipt of a certificate from Heidelberg on February 22, 1960 honoring the fiftieth anniversary of his Ph.D. examinations. While working for his degree he made his first foreign field trip, to Norway, for studies in marine biology. His dissertation was concerned with the evolution of, and distribu-

tional patterns shown by the unionids in the Upper Rhine Valley. Considerable field work, both winter and summer, was required. Collecting unionids is not at all glamorous, but is a wet and muddy activity. Although Fritz was working for a Ph.D., even during the winter months he felt it was prudent to walk the streets until his clothes dried, rather than coming home wet and muddy to face his mother's concern. This problem is common with young naturalists today and is solved in similar fashion.

Early in 1910 be began publishing a continuation of the "Die Unioniden" in Martini–Chemnitz and on January 1, 1911 was appointed Assistant Keeper of Invertebrate Zoology at the Natur-Museum Senckenberg, Frankfurt. Field activities in many parts of southern Germany, a continuous stream of publications on unionids and work with the huge unionid collection were mixed with reports on mollusks from Indonesia and the Sudan, his first of many papers on expedition materials.

In August, 1914, Fritz and two companions were on a collecting trip in the Pyrenees. Human habitations and interesting land mollusks seldom are found together, and their infrequent visits to small towns were only to replenish supplies. Many informal and officially unobserved crossings of the French–Spanish border were made. Unexpectedly, a visit to a small French town provided a turning point in his career. Unknown to the collectors, full troop mobilization of the French and German armies had been ordered. Shooting had not started, but people were alert for spies and saboteurs. The appearance of three Germans in a French border town resulted in swift arrest. Fortunately, the local magistrate was intelligent and no more in favor of war than were the German snail collectors. Instead of being interned, the Germans were kept under comfortable armed guard for one night, then allowed to go by train to Sète, where they just managed to obtain passage to Spain on a crowded ship.

Hence World War I saw Fritz Haas stranded in Spain rather than interned in France. It was not until 1919 that he returned to Germany, but the intervening years had been very productive. He made quite extensive collections, published studies on historical unionid collections in Spanish museums, sent letters to Frankfurt outlining his intensive collecting efforts in the Pyrenees and began to prepare the long series of papers (1919–1921) with Arturo Bofill that remain as definitive works on the Spanish fauna.

The inflation and economic turmoil of Germany in the 1920's restricted Fritz's field work, but barely slowed his research activity. Early in 1920 he became editor of the *Archiv fur Molluskenkunde*, the successor of the venerable *Nachrichtsblatt*. In 1921, a volunteer worker from Mainz, Helene Ganz, was assigned to help Fritz Haas at the Senckenberg Museum. She proved indispensable, and on March 30, 1922, shortly after Fritz had been promoted to Keeper of Invertebrate Zoology, she became Mrs. Fritz Haas. Forty-five years later, she is still assistant and helper in his work and his devoted companion.

Economic conditions ended publication of his work "Die Unioniden" as part of Martini–Chemnitz, but an invitation to write the "Bivalvia" section for Bronn's *Klassen und Ordnungen des Tierreichs* provided another outlet for Fritz's energies. Eventually this project was to number over 2,400 printed pages. The first section was issued in 1929, but not until 1956 did the final part appear. During the 1920's, he also wrote the "Lamellibranchia" section in *Die Tierwelt der Nord- und Ostsee* (1926), "Fauna Malacológica Cataluña" (1929) and "Bau and Bildung des Perlen" (1931).

During part of 1931 and 1932 he was in southern Africa as a member of the Schomburgk Expedition. Material from the Congo, Angola, Rhodesia, Kenya and South Africa, much of which was self-collected, was reported on in his "Binnen-Mollusken aus Inner-Afrika" (1936).

— Second was the presentation of 125 congratulatory letters from malacologists in all parts of of the world and from his museum colleagues. In gentle retribution for years of etymological puns, the letters were bound with a frontispiece (this month's *Bulletin* Cover) featuring European hares. The German word for hare is *Haas*. Artist Marge Moran included several animal species named after Fritz Haas, among them a frog, a fish, several clams and snails, a leech and parts of an isopod.

Increasing governmental persecution of Germans belonging to the Jewish faith penetrated even into museums and forced his removal as Keeper of Invertebrate Zoology at the Natur-Museum "Senckenberg" on June 30,.1936. It became obvious that the Haas family had to leave Germany. Personal savings were used for Fritz to visit Brazil and the United States in search of a job. During the first part of 1937 he collected in northeastern Brazil, the ostensible reason for the trip, and was aided by R. von Ihering, nephew of the famous Hermann von Ihering, with whom Fritz had collaborated for many years. His first attempts at job hunting in the United States failed. Economic conditions of 1937 and 1938 did not permit hiring of malacologists by American museums. After considerable difficulty, and with the help of the Emergency Committee in Aid of Displaced German Scholars and the generosity of the Jewish Welfare Fund of Chicago, Fritz Haas was hired as Curator of Lower Invertebrates by the Field Museum of Natural History, Chicago. Although the United States did not require his return to Germany before re-entering the United States as an immigrant, in order to be certain that his wife and two children could join him, he went back to Frankfurt in March, 1938. Permission to leave included taking only 10 marks for each adult, and on July 22, 1938 the Haas family landed in New York. On August 1, 1938 he started work at the Field Museum.

At the age of 52, when many scientists are actively planning for retirement, Fritz Haas had to begin a second career. From the huge collections and fantastic library resources of Senckenberg, which rank among the finest in the world, he

Fritz in 1938, shortly after coming to Chicago and Field Museum

came to a Museum where the only invertebrates were left-over exhibits from the Columbian Exposition of 1893, there had never been an invertebrate zoologist, and only minimal literature on mollusks was available.

During his first 28 years of research activity he had at his fingertips unequaled raw materials and library facilities. Now, instead of using established facilities, he had to develop these resources. The Frankfurt Museum had accumulated the collections of competent specialists for 120 years; at Chicago there was miscellaneous material of little scientific importance and a few pretty sea shells from exhibits.

Over the next 18 years, with only occasional help from summer workers and volunteers, he expanded, rehoused, relabeled, and reidentified the miscellaneous collections of mollusks in the Field Museum. With the strong backing of Chief Curator of Zoology, Karl P. Schmidt; the Museum Director, Clifford C. Gregg; and President of the Board of Trustees, Stanley Field, an excellent molluscan library was gradually accumulated, modern storage facilities were provided and the nucleus of a research collection established. With admirable foresight, recognizing the inevitable growth of collections, he developed a system of specimen storage that uses far less space per set of shells than is required in other museum collections. Although at Frankfurt he had emphasized research, he greatly enjoyed bringing order out of chaos and seeing the collection begin to reach usable proportions. Progress was slow, and when I first met Fritz Haas, in 1943, parts of the original marine shell collection still had to be reordered. Naturally, he had given first attention to the unionid clams and all non-marine mollusks, leaving the sea shells until last. The sight of these numbered specimens, lying loose in huge wooden trays with the old-fashioned exhibition labels lying torn and dirty beside them, gave me some feeling of what the first few months at Field Museum must have meant to Fritz Haas.

At first, with all his efforts required to organize the collection, publications were few. Early years in Chicago saw his "A tentative classification of the Palearctic Unionids" (1940), summarizing 33 years' work on unionids in Europe, several notes resulting from his work on the Field Museum mollusk collection, and the first few descriptions of South American non-marine mollusks. In 1942, Field Museum purchased the Walter F. Webb collection of land and freshwater shells. Consisting primarily of the Gerard K. Gude collection, supplemented by one part of the Quadras Philippine collection, plus many other shells purchased by Webb, this provided the nucleus of a research collection. Many small collections from numerous sources were received and processed. By 1954, when the 20,000 sets of the Webb collection finally were completely integrated, 54,000 entries comprised the Field Museum's mollusk collection. Essentially, all of these had been labeled, catalogued and reidentified by Fritz Haas.

Through the years, much material from South America came to Fritz Haas for study. Some were taken on Field Trips and Expeditions of Field Museum of Natural History, others came from correspondents or resident scientists in Latin America. Fritz Haas also made several brief trips to different parts of the United States, Bermuda, Cuba and Canada. While he produced many short papers on these collections, his main efforts were devoted to descriptions and distributional studies on Latin American shells. Next to the Unionidae, he described more taxa of Bulimulidae than any other group. Most of these names date from his work in Chicago during the 1950's and early 1960's.

— The occasion of the presentation was also a "bon voyage" party: two days later Dr. and Mrs. Haas flew to Frankfurt, Germany, as honored guests at the 150th anniversary of the Natur-Museum Senckenberg.

In 1956, I was added to the staff as Assistant Curator of Lower Invertebrates, and on January 1, 1959, Fritz Haas officially retired to become Curator Emeritus of Lower Invertebrates. Thus progressively freed from administrative responsibility, and for the first time in his working days, having assistance in the routine of specimen processing, Fritz could adjust his work habits to a new schedule. Mornings he devoted to checking identifications and cataloguing material from the great influx of formed molluscan collections that were received by the Museum during the late 1950's. At first he missed typing his own labels and housing the specimens himself, but he soon began to enjoy this new freedom from drudgery. Through 1965 these morning endeavors added an average 5,000 sets per year to the mollusk collection. The 156,000 catalogued sets of mollusks now in the Field Museum of Natural History were possible only because Fritz Haas devoted so many years to routine specimen processing.

Afternoons were reserved for research. From the summer of 1961 until late in 1964, every afternoon was spent preparing his manuscript for "Das Tierreich." The growing staff was treated to a never ending rattle of his typewriter as the manuscript piled higher and higher. A "two-fingered" typist, Fritz's speed was legendary among museum secretaries. After completing the unionid revision, Fritz switched to full-time work on the formed collection backlog, except for occasional study of new South American material. In December, 1965 he suffered a stroke and, until recently, was only partly active. Resumption of activity and arrival of galley sheets fortunately coincided.

For decades his hobby has been etymology and his linguistic abilities are considerable. By his own reckoning, he speaks German, English, French, Spanish and Catalonian, and can read and understand Portuguese, Italian, Dutch, Swedish, Danish, Latin and Greek. More than slight knowledge of several other languages was often evident, but he never claimed fluency. Throughout his life he has been a voracious reader and, in every sense of the word, Fritz Haas is a truly educated man. His knowledge of the humanities is encyclopaedic. In later years, he over-awed generations of students from Antioch College who could not believe that a scientist would know more art, literature or music than a college major in that subject.

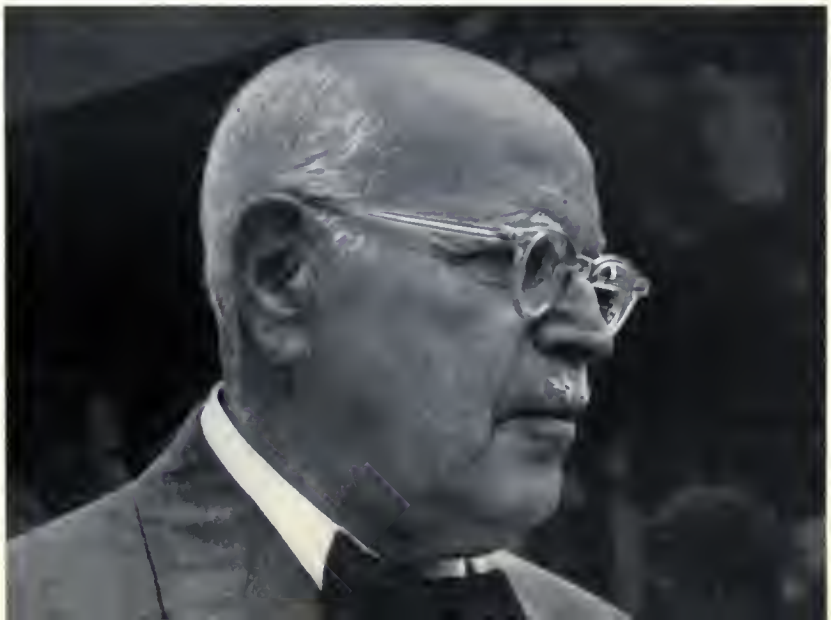
Of equal amazement, then delight to successive student workers, and of continual plessure to the Museum staff, is his pixilated sense of humor. Often one is left speechless. Although slowed by the stroke, his humor remains undiminished. In mid-1966, our new divisional secretary, Mrs. Rendleman, was brought up short by being called "Mrs. Debarker."[1] Although managing to retaliate with "Dr. Bunny," she was corrected, with a twinkle, as to her mistaken etymology. On his return this year from Florida, where he had been a refugee from cold and snow since Christmas, he replied to questions about how he felt with "My doctor hasn't told me yet!" In keeping with this, although many species and several genera have been named after him, his greatest pleasure was in learning of *Pisidium lepus* Kuiper, 1957, a translation of his name well fitting his sense of humor.

Throughout the years, he has served as a major resource for the scientific and library staff of Field Museum. Some of my earliest memories concern the streams of Museum staff with questions as to European or African localities, letters to be translated, or classical allusions to be explained. Instead of coffee breaks, Fritz takes walking breaks through the other scientific departments. It soon became a habit to hold queries for him. Often the short walk developed into a long absence during which he aided in some translation or helped locate some obscure locality. He was often the despair of our telephone operator who had to locate him "somewhere" in the building.

Work has always been a personal and private matter for Fritz Haas. In keeping with the tradition of Kobelt, who refused to publish his own views on unionid evolution until after Bourguignat was dead, Fritz has not indulged in published controversy. It is only with the utmost difficulty that he can be persuaded to comment on papers written by others, particularly work relating to the unionids. Similarly, despite almost 25 years of association and friendship, the only comments he has ever made on my manuscripts have been to correct the gender of a name or to insert needed diacritical marks. By the same token, his manuscripts were not shown to other malacologists prior to publication for comments and suggestions. Conversations with Fritz on any subject but scientific matters are delightful and fascinating, but none of his Museum colleagues can recall having had a lengthy scientific discussion with him.

This seeming aloofness from controversy and lack of communication with fellow scientists express the mores of a gentler era and the view of a truly inner directed man. Throughout his two careers, in Frankfurt as the user of major research facilities, and in Chicago as the developer of major research facilities, his life has been guided in a successful search for knowledge. Few people have a distinguished career of thirty working years. We are proud and grateful that Fritz Haas' second thirty-year career is being spent at the Field Museum of Natural History.

[1] Rendleman may be derived from the German *Rindenmann*, the person who strips the bark off logs in a sawmill.



Fritz in 1964, at the meetings of the American Malacological Union

Eskimo Whaling Charms

By James W. VanStone, Associate Curator,
North American Archaeology and Ethnology

The village of Point Hope on the Bering Strait, is some 700 air miles from Anchorage. The author relates two objects collected there in 1897 to his own observations on Eskimo culture, made seventy years later.

In FIELD MUSEUM's ethnographic collections from northwest Alaska are two skillfully carved representations of the bowhead whale (*Balaena mysticetus*), an animal intimately associated with the economic and ceremonial life of the people of this area. Both these objects were collected in the coastal village of Point Hope in 1897 by Mr. Miner W. Bruce and acquired by the Museum the following year. Mr. Bruce had come to Alaska as first superintendent of the reindeer station at Port Clarence on Seward Peninsula.

My interest in these carvings grew out of a general interest in the Eskimos of northwest Alaska and specifically in the village of Point Hope where I lived for more than a year in 1955–56. With the idea of learning more about these particular carvings, as well as other objects in the Museum's Eskimo collections, I returned to Point Hope in the summer of 1967 with photographs of the specimens to show to elderly villagers. I hoped that the pictures would encourage some people to recall details about the significance of these objects to their nineteenth century forebears. Some of the information that I obtained is included here.[1]

[1] I would like to thank Mr. David Frankson and Mr. Jimmy Killigvuk of Point Hope, and Mr. Charlie Jensen of Kotzebue for their assistance in collecting the field data on which this paper is based.

Since both of these carvings are closely related to Eskimo whaling and the whale cult, it seems worthwhile to make some brief comments about this activity at Point Hope. Like the residents of a number of other communities in northwest Alaska, Point Hopers have, for centuries, hunted the great bowhead whales each spring as they move up the coast on their annual migration into the Beaufort Sea. Whaling is a communal activity involving a number of crews, each one using a large skin-covered boat, an *umiak*. Each whaling captain (*umelik*) is responsible for preparing his boat and equipment and securing the services of a crew. Historically, the *umelik* has held an important position in Point Hope village life. He was normally the wealthiest man in the large extended family that characterized village social structure, and his position and prestige were achieved through skill, energy and the inheritance of property. Very often he was a shaman (*angatkok*) as well. *Angatkoks* were men or women who had visional experiences and special powers which segregated them as persons possessing unusual control over nature and natural forces. There was always one in every whaling crew.

When the whales begin to appear opposite the village in early April, the crews go out to the edge of the ice where the boats are drawn up in such a manner that they can be launched at a moment's notice. When a whale is sighted, all boats set out in pursuit. The harpooner sits at the front of the boat and as it approaches the whale, he stands up and drives the harpoon deep into the animal's body. The whale then sounds, taking with it the line attached to the harpoon and to a series of floats. All boats gather in the vicinity of the place where the strike was made and wait for the floats to reappear, a sign that the whale will soon surface. When the animal appears, the boats rush forward and attempt to affix other harpoons until the whale comes to the surface dead.

A Successful Whaling hunt.

After the whale has been killed, the carcass is towed back to solid ice where the entire village participates in the butchering process. All the boats share in the whale, each boat crew being entitled to a particular portion depending on the order of arrival at the scene of the kill. Whale hunters remain continually on the ice as long as there are open leads or large ponds where whales can breathe. When the wind shifts and closes the leads, the crews go ashore for much needed rest. By early in June, most of the bowhead whales have passed Point Hope and the season is over.

This is the manner in which whales were hunted during many centuries of Eskimo prehistory and, with the exception of certain technical innovations such as harpoon guns and bombs instead of slate harpoon blades, it is the way in which the activity is carried out today.

The Eskimos of Point Hope hunt seals, walrus, polar bear, caribou and many other animals besides whales. As might be expected, therefore, the supernatural relationship between men and animals was a very important one in aboriginal times and was expressed, for the most part, through the medium of charms or *angoaks*. An *angoak* was a simple charm worn on the body or clothing, or kept in a special place. It could be a stone, certain bones, the head of a loon, or just about anything. In some supernatural manner, a person's *angoak* associated him with certain animals that would assist him in hunting and rescue him from danger. In a very real sense, they were guardians, but no visional experience was necessary to obtain them.

At Point Hope a person usually received his charms, together with a complex set of instructions, in early childhood from some elderly person who wished to transfer his own. The child usually took one of the names of his benefactor thus becoming his namesake. But charms could also be given by parents in which case they were often the *angoaks* of deceased relatives. Very frequently food taboos were associated with charms.

As might be expected, there were many *angoaks* associated directly with whaling and this brings us to a discussion of the wooden carvings in the Museum's collections. Figure 1, a and b, is the lid of a box in which whaling charms were kept, and it contained not only those *angoaks* belonging to the *umelik*, but also those of the harpooner and other members of the crew. This lid features the carving of a whale in prominent relief on the outer surface (a); the eyes of the animal are small blue beads. On the lower edge of the specimen, holes have been drilled in such a way as not to penetrate the outer surface of the lid. Sinew thongs fastened the lid to the box. It is the reverse (b) side of this specimen, however, that is of particular interest, since directly in the center is an inset triangular piece of chipped quartzite. According to informants at Point Hope, this was someone's personal *angoak*, probably that of an *umelik*, and it was kept in the box lid so that it would be available for instant use. If the captain was also an *angatkok*, as was frequently the case, he would have the ability to swallow an *angoak* like this one and disgorge it at will.

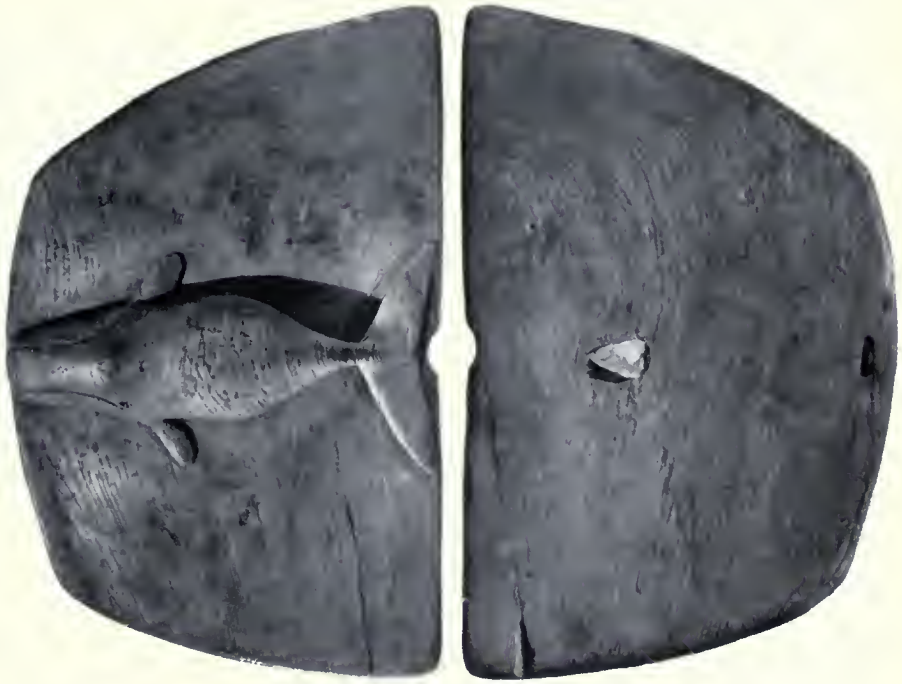


Figure 1. Lid of box for whaling charms. On left, view (a); on right, view (b). cat. no. 53423, 34.5 cm. wide, wood.

These boxes in which whaling charms were kept are called *udlun* which means, literally, "a nest." They were more often fashioned in the shape of a whale rather than just having a whale represented on the lid as in the case of the Museum's example. Often they were marked with soot or grease, a mark being made for each whale taken by the owner of the *umiak*. An extra supply of harpoon blades and other equipment associated with whaling might also be kept in such boxes. While the *umiak* was at sea, the box was placed under the gunwales at the bow.

Not all whaling charms were kept in boxes like the one just described. A charm might be fastened directly to the prow of the *umiak* and an example of this type of *angoak* is illustrated in Figure 2. Such a charm belonged to the whaling captain and was usually carved by the *angatkok* in his crew, although it could be inherited. The Museum's specimen would have been placed at the very front of the *umiak* between the gunwales and lying flat on the up-curved end of the keel. There are holes for lashing with sinew or baleen to the gunwales. The carved whale is in high relief and, like the one on the box lid, has blue beads for eyes. When the *umiak* was not being used for whaling, this type of *angoak*

would be removed from the boat and stored in the *umelik*'s house.

With reference to whaling charms in general, it can be said that they were believed to have a compulsive effect that served to bring the whale close to

Figure 2. Whaling charm for attachment to an umiak. Wood, cat. no. 53424, 36 cm. wide.

the boat. In fact, informants called the *angoak* just described, *poesowruk* which means "luck for whale to come up close to the boat." Charms also served to make the animal more tractable and amenable to harpooning. Since it was believed that the whale's soul passed into another whale when it was killed, any irregularity of procedure was thought to disturb it. The whale could see the preparations that were being made to kill it and on that basis could decide whether to allow itself to be taken by men. The charms, therefore, served both to placate the whale and to compel it to come close by magical means.

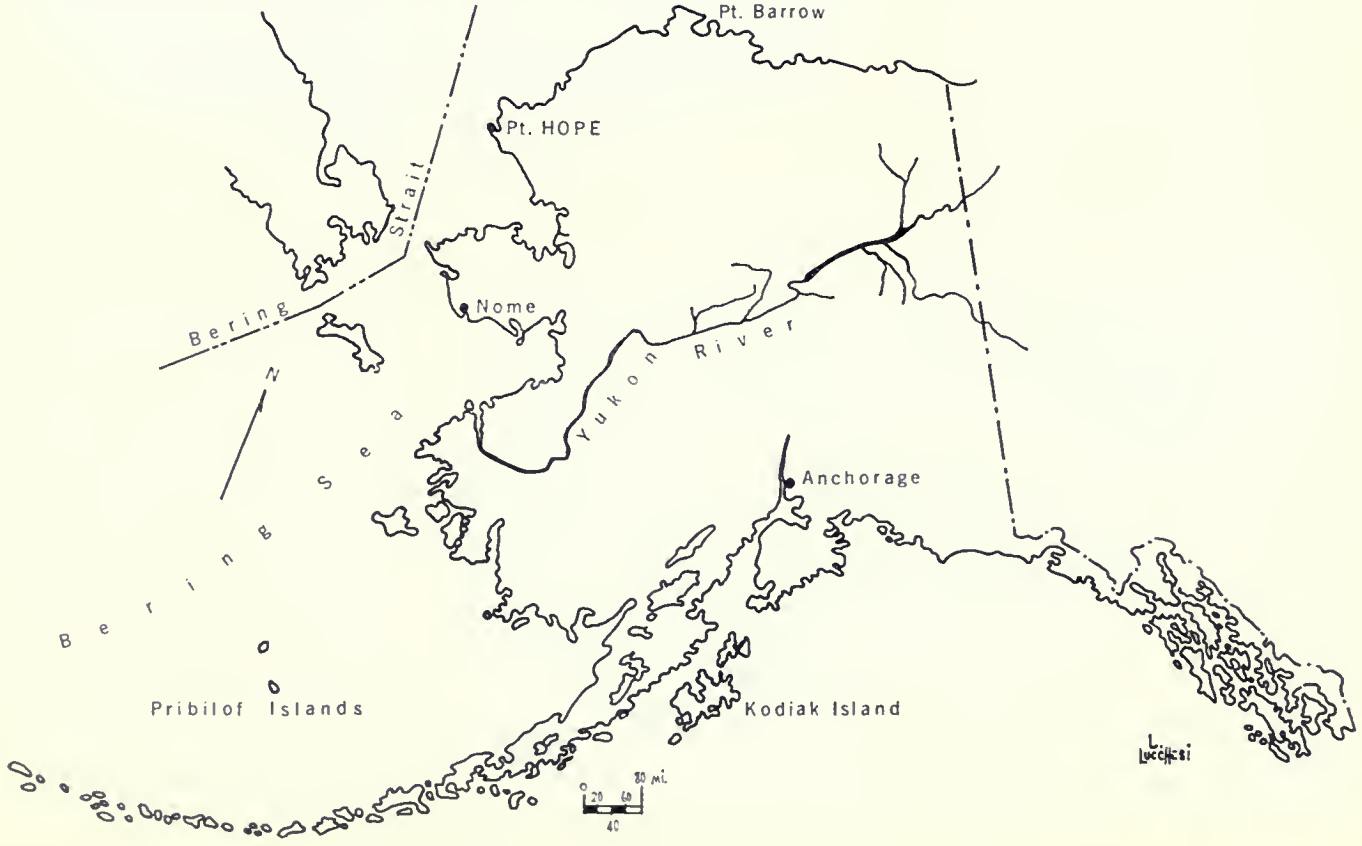
In conclusion, I would like to point out that this brief discussion in no way does justice to the complexity of Eskimo theory regarding man's relationship to the supernatural world. It does, however, attempt to indicate the cultural significance of two very fine examples of Eskimo craftsmanship. Although much has been written on Eskimo whaling and associated beliefs, *angoaks* and related objects resembling these have not previously been described or illustrated. But more important than this is the fact that our discussion here indicates there is still much to be learned about museum specimens from the descendants of those who made them. In northwest Alaska it is no longer possible to obtain ethnographic specimens similar to those on exhibit in Hall 10 and in the Museum's study collections. But it is possible to elicit additional information about these specimens that were collected so long ago. Such information can add immeasurably to the scientific value of the collections. Because of the nature of culture change in the area, northwest Alaska is far from being an ideal place in which to reconstruct ethnography. But the very fact that there is something left for the student of traditional material culture, suggests the possibilities that may exist in parts of the world where the impact of Euro-American culture has been less intense and where, as a result, culture change has progressed at a slower rate.

REFERENCES

RAINEY, F. G., The Whalehunters of Tigara *Anthropological Papers of the American Museum of Natural History*, Vol. 41, pt. 2. New York, 1947.

SPENCER, R. F., The North Alaskan Eskimo A Study in Ecology and Society. *Bureau of American Ethnology, Bulletin 171*, Washington D. C., 1959.

VANSTONE, J. W., *Point Hope, an Eskimo Village in Transition*. University of Washington Press, Seattle, 1962.



recent acquisition—zoology

Little-known Caecilians Feature of New Collection

The Field Museum of Natural History has recently received a most noteworthy herpetological collection. The purchase of over 10,000 specimens of reptiles and amphibians from Dr. Edward H. Taylor, Professor Emeritus of the Department of Zoology, University of Kansas, has greatly complemented our Division of Amphibians and Reptiles collection. This acquisition represents the second large collection received from Dr. Taylor, for in 1959 over 25,000 reptiles and amphibians that he amassed were incorporated into the Museum's herpetological holdings.

Siphonops annulatus, *a worm-like amphibian*

The new material greatly strengthens our representations in two areas. It contains much of the studied material Dr. Taylor used in his three volumes on the reptiles and amphibians of Thailand. This extensive systematic treatment of the Herpetology of Thailand and the availability of the collection of specimens will form an excellent base for further systematic research on the herpetological fauna of southeastern Asia and the Indo-Australian Archipelago. In addition, parasitologists and ecologists (to mention a few other biologically interested fields) will have available literature and specimens for confirmation of species used.

In addition, a 900-page volume by Dr. Taylor will appear during the latter part of 1967, monographing the entire order of caecilians—Order *Gymnophiona* (or *Apoda*). A major portion of the matrrial for this scientific text is contained in this collection. The earthworm-like caecilians represent one of the three major groups of amphibians, the other two being frogs and salamanders. These "worms" of the vertebrate world are one of the least known and least studied of the major groups, due primarily to the extreme rarity of specimens in research collections. Secretive, burrowing animals in tropical forests, they are difficult to collect. Adding his collection of this rare group of vertebrates will increase the number of the Field Museum specimens two and one-half times and its scientific value immeasurably.

In addition, there is herpetological material from all areas of the world—southeast Asia; tropical Africa; Australia; and North, South and Central America. To emphasize the extent of this material, Dr. Taylor has incorporated much of it in approximately 2,300 published pages on herpetology from 1960 through 1967.

Dr. Edward H. Taylor's long history of herpetological publications, dating from the early part of this century has left its mark on the history of Herpetology. His prolific pen has produced a geographically large variety of scientific texts, and much of the material his scientific activities produced will be housed, cared for and used extensively in future research at the Field Museum of Natural History.

—Hymen Marx, Associate Curator, Amphibians and Reptiles

lecture—December first

Dr. Wylie to speak on Tibetan Religion

Dr. Turrell V. Wylie, Associate Professor of Tibetan languages and Civilization, the University of Washington, will speak on Tibetan Religion at Field Museum on Friday, December 1, at 8:30 p.m. in the Museum's Lecture Hall. A leading Tibetan scholar, Dr. Wylie has been executive Chairman of the University of Washington's Inner Asia Project since 1962. He has published a number of articles on Tibetan culture, poetry and history.

Tibetan religion is composed of two elements: the first, an indigenous primitive system, and later, a highly developed form of Buddhism derived from India.

Siphonops *devouring an earthworm. Both caecilian photos by Carl Gans.*

Nicaragua Commemorates Its Orchids

Orchid collecting, and growing orchid plants have enjoyed an enormous increase in interest in recent years. In 1940 I became editor of the *American Orchid Society Bulletin*, then a small quarterly magazine which we hoped to change to a monthly. There were about 200 members in the society

at that time, as I remember. The *Bulletin* "caught on" and sparked a latent interest in orchid growing. The American Orchid Society began to grow by leaps and bounds and with it, of course, the *Bulletin*. When I was called away in early 1943, the *Bulletin* went to thousands instead of hundreds of members—Gordon W. Dillon, a colleague and friend became editor. The *Bulletin* nearly 25 years later goes to almost 12,000 members of the Society, an indication of the interest in orchids in our country. The American Orchid Society has 215 regional societies as affiliates. Not all the members of the affiliated societies belong to the parent organization.

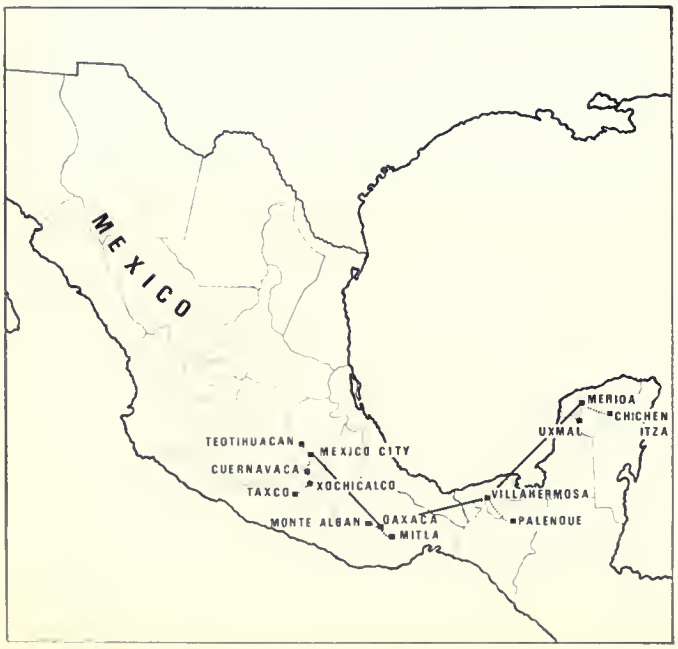
Philatelists are another group of people who collect—in this case postage stamps. There is enough interest in collecting stamps that show orchids for the American Orchid Society to sponsor a quarterly *Orchid Stamps News*. Some stamp collectors put into their collections all the stamps they can get. Most, of necessity, limit their collections in one way or another, perhaps to a country or group of countries —or even to tropics. The collecting of stamps that show only orchids (such a collection was shown at the last orchid show in the Museum) must now be an exciting hobby, for more and more of these stamps appear. Thereby hangs a tale.

Alfonso H. Heller moved to Nicaragua a number of years ago. The orchids of that botanically little-known Central American country attracted his attention. He began to collect them and soon found that there were many more kinds of orchids in Nicaragua than had been suspected. Mr. Heller began to study them critically and to make very accurate drawings of them from living material. Concurrently he described them from the same living material. Mr. Heller is the first person who has had an opportunity, and the artistic skill, to do this type of botanical research for a Central American country.

A friend suggested that Nicaragua should have a series of stamps showing native Nicaraguan orchids. Mr. Heller prepared the material for a set of stamps and from his work a series of ten stamps was made. The issue is illustrated here.

Collectors of natural history stamps will be pleased to know a set of Nicaraguan butterfly stamps has been released recently. These are based on Mr. Heller's collections also. —*Louis O. Williams, Chief Curator, Botany*

Route of the Mexican Tour



Field Museum's Mexican Tour April 4–21 will make the long strides by air (solid lines) and the short distances by air conditioned motor coach (shown in broken lines), permitting economical use of time and thorough study of the entire setting and ecology of the areas. The Tour will travel from Mexico City to Teotithuacán and from Mexico City to Cuernavaca, Xochicalco and Taxco by motor coach. It will fly to Oaxaca City, but go by bus to Monte Alban, Mitla and Santa Maria del Tule. After flight to Villa Hermosa, in Tabasco, the group will visit the ruins of Palenque, in Chiapas, by motor coach and fly to Mérida, busing to the Maya centers of Uxmal and Chichén Itzá in Yucatan. Specialists in horticulture, botany and archaeology will accompany the Tour, which will visit private homes and gardens and wild areas as well as museums and archaeological sites. Tour price, including all expenses and a $200 tax deductible donation to Field Museum, totals $975. For further information or reservation (accompanied by $200 deposit), write Field Museum's Mexican Tour, Field Museum.

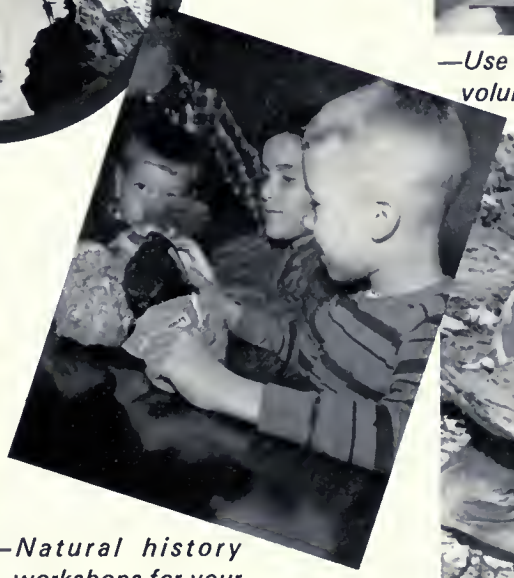
What Museum Membership means to you...

—Members' Night, meeting Curators and Staff who guide you through the working areas

—Ten percent discount on books and curios at the Book Shop, free admission and checking

—Use of the Library, with its 160,000 volumes on natural history

—Reserved seats at 18 Film-Lectures during the year



—Natural history workshops for your children and grandchildren

—And most important, you are supporting research in our laboratories and in the field

—Special showings and previews of new exhibits

. . . and the Bulletin

Give Museum Memberships for Christmas

Help your friends enjoy these benefits

Use the special envelope enclosed.

PANAMA HONORS SCIENTISTS

The Panamanian and American flags flew together over Field Museum on October 23, when Field Museum's Dr. Rupert L. Wenzel and Lt. Col. Vernon J. Tipton, U. S. Army Medical Service Corps, received the National Decoration of the Government of Panama, granted by special decree of Panamanian President, Marco A. Robles. Mrs. Angela Muñoz de Lew, Consul-General of the Republic of Panama, decorated the two scientists with the *Orden de Nuñez de Balboa* in the grade of "Caballero" in recognition of their co-editorship of *Ectoparasites of Panama*.

Mrs. Angela Muñoz de Lew decorates Lt. Col. Tipton and Dr. Wenzel.

The book's material on ectoparasites is the most complete study ever made of these biting insects in any tropical country. It contains descriptions, illustrations and environmental studies of hundreds of kinds of fleas, biting flies, chiggers, ticks and other blood-sucking insects. *Ectoparasites of Panama* is already being used in vital bio-medical surveys now underway along proposed routes for a new canal linking the oceans. The surveys are aimed at determining what disease carriers are present along the proposed routes so that measures can be taken for their control. This use of the *Ectoparasites of Panama* is just a suggestion of its potential benefit to the health of people living in tropical regions of America.

FIELD MUSEUM
OF NATURAL HISTORY
ROOSEVELT ROAD AT LAKE SHORE DRIVE
CHICAGO, ILLINOIS 60605 A.C. 312, 922-9410
FOUNDED BY MARSHALL FIELD, 1893

E. Leland Webber, Director

BULLETIN

Edward G. Nash, Managing Editor

MUSEUM SPONSORS INDIANA UNIVERSITY THIRD CONCERT SERIES

Indiana University will present three concerts in its third annual Chicago Showcase of Music. Two of these will be free concerts at the Museum: February 6, 1968, Alfonso Montecino, Pianist; and March 26, 1968, The Baroque Chamber Players. Tickets for these concerts may be obtained by sending a request to Indiana University Concerts, care of Field Museum.

The first concert will be presented at Orchestra Hall, Monday, November 20, 1967, and will be by the Indiana University Philharmonic Orchestra. Tickets for this concert may be purchased at Orchestra Hall. However, in appreciation of the Museum's cooperation in the presentation of the Showcase of Music Series, the Indiana University Foundation has made available, for Museum members, a limited number of free tickets. These tickets will be sent to members requesting them, as long as the supply lasts. Requests will be filled in the order received.

CALENDAR OF EVENTS

November hours: Open from 9 a.m. to 4 p.m. daily and until 5 p.m. Saturdays, Sundays, Thanksgiving and Nov. 24.

November 4 Film-Lecture: The Philippines by Clifford J. Kamen. 2:30 in James Simpson Theatre.

November 5 Audubon Film Series: Tidewater Trails by Charles T. Hotchkiss. This color film recaptures the wild beauty of 18th century tidewater Virginia. 2:30 p.m. in James Simpson Theatre.

November 11 Film-Lecture: Men Against the Ice by Bjorn Staib. 2:30 p.m.

November 18 Film-Lecture: Red China by Jens Bjerre. 2:30 p.m.

November 25 Film-Lecture: England and Wales by Gerald Hooper. 2:30 p.m. in James Simpson Theatre.

November 29 Members' Preview of New Permanent Exhibition: Tibet—High Land of Monk and Nomad. Hundreds of specimens portray both the religious and secular lives of the little-known Tibetans whose ancient way of life is rapidly changing under the Chinese Communist regime. A movie shows the remote Himalayan civilization. The exhibit opens to the public the following day.

Through November 26 Exhibit: Silent Cities: An Architect's View of Ancient Mexico and the Maya by Norman F. Carver. Hall 9 Gallery.

Through November Fall Journey: Your Day in Ancient Rome.

December 1 Lecture on Tibet by Dr. Turrell V. Wylie, Associate Professor of Tibetan Language and Civilization at the University of Washington, Seattle. Dr. Wylie will talk on Tibetan religion, illustrating his points with color slides. 8:30 p.m. in the Museum's Lecture Hall.

December 10–January 21 Exhibit: New Guinea: Birds, Books and Stamps. This exhibit announces the American release of the book *Handbook of Birds of New Guinea* by Drs. Rand and Gilliard, and the recent acquisition of a large collection of study skins of New Guinea birds. Hall 9 Gallery.

December 16 City-Wide Youth Orchestra Concert. Under the leadership of Mrs. Fanny Hassler, 50 Chicago area youngsters, aged 12 to 17, present music by Franck, Brahms, Tchaikovsky and Mendelssohn. 2 p.m. in James Simpson Theatre.

MEETINGS:

Audubon Society, Nov. 1, 7 p.m.
Chicago Shell Club, Nov. 12, 2 p.m.
Nature Camera Club, Nov. 14, 7:45 p.m.
Illinois Orchid Society, Nov. 19, 2 p.m.

PRINTED BY FIELD MUSEUM PRESS

BULLETIN **FIELD MUSEUM OF NATURAL HISTORY**

Volume 38, Number 12 December 1967

New Exhibit Opens

In creating its new permanent exhibit "Tibet, High Land of Monk and Nomad," Field Museum drew on its two greatest resources: the superb collections of cultural materials, and the varied skills and talents of its staff.

The Tibetan collections, in the main, were gathered by Berthold Laufer on the Mrs. T. B. Blackstone Expedition to China and Tibet from 1908 to 1910. Laufer, Chief Curator of Anthropology for many years, was a famed Sinologist and Tibetanist. He amassed a wide variety of materials and artifacts, ranging from toys and costumes to kitchen utensils and religious objects. His material, along with some later additions, has enabled Field Museum to give something of the "feel" of life in nineteenth century Tibet. Since religion dominated the social structure and life of Tibet, the new exhibit gives a strong emphasis to the religious life of the Tibetan Buddhist, although many common, everyday things are displayed.

The Tibetan project began some four years ago, with the completion of the Chinese Hall, "China in the Ch'ing Dynasty." Kenneth Starr, Curator of Asiatic Archaeology and Ethnology, was in over-all charge of the planning of the exhibit. Working closely with him were artist Theodore Halkin and Assistant Georgette Meredith, a student of Tibet, now on the faculty of the University of Wichita. The physical design of the exhibit is Halkin's work and he has introduced a number of departures in museum exhibition. The use of carpeting and color, particularly a rich Tibetan red, greatly enhances the attractiveness of the exhibit. See-through exhibit cases are used for the greater display of material. Perhaps the most interesting innovation is the construction of a small theater in which a short film on Tibet will be shown. The film was taken in 1926 and 1927, when the traditional ways of nineteenth century Tibet had not yet been disturbed. The ten-minute film serves as a kind of focus for the entire exhibit, showing the high, rugged landscape, nomads with their herds of yak, a market scene, and a pageant in one of the great Tibetan monasteries.

Curator Kenneth Starr assembles a "ghost trap" for exhibit opening. The trap, which is supposed to attract illness-causing ghosts, is used in treating the sick. It was made for the Museum by Dagmola Sakyapa, of Seattle. Mr. Sakyapa and his wife demonstrated Tibetan music and dance at the Members' Preview of the exhibit. The University of Washington is an important center of Tibetan studies and the Tibetan colony in Seattle is probably the largest in the country.

Dozens of people become involved as an exhibit progresses. While Ted Halkin worked on the physical concept of the exhibit, beginning with a small cardboard and plywood mock-up, Miss Meredith worked on the scientific end, researching the files and catalogs of the collections, and preparing the hundreds of labels. Mrs. Christine Danziger, Conservator, and Walter Reese, Preparator, restored many of the objects in the Museum's Robert R. McCormick Conservation Laboratory. With the dirt and stains of the years removed, and the surfaces treated, a large number of the objects appear in the exhibit as they appeared when first purchased in the markets of Tibet.

As time went on, the activity spread. James Shouba, Building Superintendent, became a kind of general liaison between the Departments of Anthropology and Exhibition and the various service divisions and suppliers. His knowledge, energy—and natural diplomacy—solved a good many problems. The physical construction of the exhibit involved the work of the Museum's carpenters, electricians, engineers and painters. The Museum Press edited and printed the labels. The Divisions of Photography and Motion Pictures lent their skills.

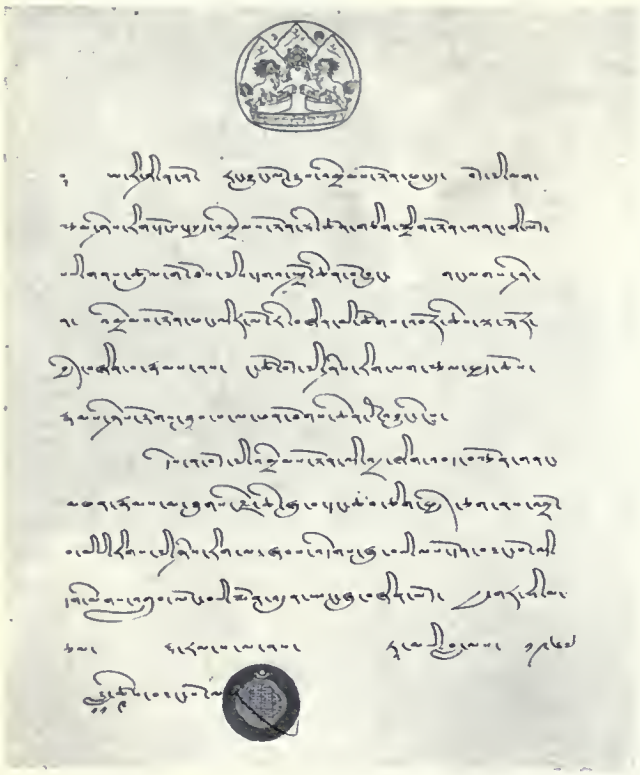
The final installation of the exhibit was the work of the newly-formed Department of Exhibition. After Ted Halkin began a leave of absence (he is teaching this year at Kendall College in Evanston), artist Walter Boyer, who had been working with Halkin for nearly two years, supervised the installation. Assisting Boyer were artist Marion Pahl, Preparator Walter Huebner and other members of the Department of Exhibition.

The arrangements for the exhibit's opening, including a special Members' Preview on November 29th were made by the Department of Planning and Development.

In short, few people in the Museum organization are left untouched by an exhibit of this size, and many share the credit for its success.

Above, Marion Pahl paints mural based on Chinese block print. The mural serves as a connecting link with the adjacent Chinese Hall. China and Tibet have long been closely connected culturally and economically. Some of the artifacts collected in Tibet are actually of Chinese manufacture, made in Peking for the Tibetan market.

Below, Building Superintendant James Shouba, left, and artist Walter Boyer inside an exhibit case. On the table are Buddhist prayer wheels. Magic knives, used in certain ceremonies, are suspended from the ceiling of the case.



The Museum received this letter from the Dalai Lama, in exile in India, about the exhibit.

Translation

I am happy to learn that the Field Museum of Natural History in Chicago is opening a new Tibetan exhibition gallery. I feel confident that it will help to create a better understanding of our unique Tibetan culture for the great many visitors who come to the Museum every year.

While thanking the people who have made this Tibetan exhibition possible, I also pray sincerely for the success of this noble task which contributes much towards the preservation of various cultures of the world.

The Dalai Lama

Swarg Ashram
Dharmsala Cantt.
District Kangra
Himachal Pradesh,
India

Preparator Walter Huebner mounts a relief map of the "Roof of the World" in the exhibit theater.

A SHORT HISTORY OF TIBET

PARTS OF TIBET were occupied from prehistoric times, when, as now, the region was peripheral to the main Asian cultural centers. In early times Tibet was an isolated land occupied by clans whose independent leaders exercised authority over their own small territories. During the 6th century A.D. a group of clan chiefs united behind one leader, and by mid-7th century the country had become a military power with its capital at Lhasa in central Tibet. The first historical king, Namri Sontsan, led successful forays into China, India and Turkestan. About A.D. 640 his son, King Songsten Gampo, demanded royal wives from China and Nepal, and it was these Buddhist princesses who were responsible for the introduction of the Buddhist religion into Tibet. In the following centuries, Tibetan history and culture became inextricably entwined with Tibetan religion, for with the introduction of Buddhism came the beginnings of a new civilization, and subsequent political events were accompanied by the successive promotion or proscription of either Buddhism or the native animistic Bon religion. Even after the final victory of Buddhism in the 11th century, conflicts for political power continued between the adherents of the various sects.

In the 10th century religious controversies contributed to the disintegration of central authority, and Tibet once again became a land of many local chieftaincies. The district of Guge, located in western Tibet, became an important cultural center at that time. The 11th century was a period of particularly intense religious activity. Students were sent to India to clarify doctrinal points, and two great masters of Buddhism, Atisa and Padmasambhava, were invited to come to Tibet. These two theologians traveled widely throughout the country, and their teachings were responsible for far-reaching reforms and the development of important new sects.

When the Mongols attacked the still divided country in A.D. 1239, the influential head lama of the Sakya sect was empowered to deal with the Mongol leaders, who made him the ruler of central Tibet. The nephew of the monk so impressed Kublai Khan that the Khan took religious instruction from him and made Lamaism the national religion of his empire. When Mongol power collapsed, the power of the Sakya hierarchy declined, and another period of political and religious chaos followed.

Toward the end of the 14th century, another great reformer, Tsong Khapa, founded the Yellow Hat sect, the Gelugpa. The concept of priestly rebirth, which later developed into the doctrine of reincarnation of deities in human form epitomized by the Dalai Lamas, originated with this sect.

Internal political wars continued throughout the 15th and 16th centuries. The Mongols, who attacked Tibet again in 1566, were attracted to the doctrines of the Gelugpa, and in 1588 the grandson of the Mongol Altan Khan was selected as the 4th Dalai Lama. With the help of the Mongols the great 5th Dalai Lama defeated the rebellious king of Tsang, or Central Tibet, thereby achieving complete spiritual and temporal power for his sect over all of Tibet. This control lasted until the mid-20th century.

Out of gratitude, the 5th Dalai Lama appointed his religious preceptor head lama of the Tashilumpo Monastery, and proclaimed him a reincarnation of Amitabha, the spiritual guide of Avalokitesvara, the deity embodied in the Dalai Lama. The next incarnation of this lama became known as the Panchen (or Tashi) Lama. Although Panchen Lamas have not been officially involved in temporal affairs, subsequent incarnations became political pawns whose favors were curried by the Chinese, and later by the British, when the Dalai Lamas were reluctant to cooperate with them. During the following four centuries, the holders of these two high offices were destined to recurring exile and triumphant return, depending upon the constantly vacillating political situation.

The Chinese, suspicious of British assistance to Nepalese Gurkha invasions of Tibet, closed Tibet to foreign contact. It was not until the bloody Younghusband Expedition of 1903–04 that Tibet came under British influence. During the first half of the 20th century the British, who supported the Dalai Lama, continued to vie for control of Tibet with the Chinese, who backed the Panchen Lama. After the Chinese Communists gained control in 1951, both lamas were permitted seats in the National Peoples Congress, but in 1959 the Dalai Lama for the second time was forced to return in exile to India, and the Panchen Lama continued in forced cooperation with the Chinese.

Nama, god of death

An Introduction

The religion of Tibet consists of two components, one, an indigenous primitive system of beliefs and practices and, two, a highly developed form of Buddhism subsequently derived from India.

The original Tibetan religion, called Bon, was characterized by good and evil spirits who inhabited every aspect of the natural world, and who could be controlled or appeased by magicians using spells, charms and even human sacrifice. Bon existed in Tibet from very early times.

Buddhism was first introduced into Tibet from India in A.D. 640. By that time it already was characterized by the presence of many Buddhas and other deities that had been incorporated into the faith during the prior 1100 years of its existence in northern India. Although actively promoted by the reigning Tibetan monarchs, Buddhism was not accepted by the majority of the Tibetan people until it incorporated as protective deities all the demons of the Bon religion which had continued to prevail. The first Buddhist monastery in Tibet was founded in A.D. 779 at Samye in southcentral Tibet, and there devotees learned from highly respected Indian and Tibetan teachers the doctrine and techniques for escaping from the misery of the never-ending life cycle described originally by the historical Buddha. In competition with Buddhism, the native Bon religion acquired a similar doctrine and pantheon, and for many years an active struggle for power went on between the corresponding noble and ecclesiastical members of the two faiths. By the 11th century Buddhism had gained the upper hand, and the formation of rival sects began. Reforms continually were undertaken to halt—if only temporarily—the constant tendency of the Tibetan version of Buddhism to rely more strongly on magic and demon worship for salvation, rather than on proper knowledge and behavior. As they grew powerful the various Buddhist sects became ever more involved in temporal affairs. Their rise and status also became a matter of active interest to the governments of China and Mongolia with whom Tibet had maintained cultural and political relations since early in the 7th century. China, in particular, most especially in the 17th century, played a major role in Tibetan politics. The most recent of the reformed sects, the Gelugpa, or Yellow Hat sect, gained ecclesiastical and cultural control in the 17th century, and its head, known popularly as the Dalai Lama, an incarnation of the guardian deity of Tibet, still held sway until Tibet again fell under Chinese control in the present century.

SECTARIANISM IN TIBETAN BUDDHISM

by Turrell V. Wylie, Associate Professor of Tibetan Languages and Civilization

THE Vajrayana form of Mahayana Buddhism was actively introduced into Tibet in the 8th century A.D. by the Indian guru Padmasambhava. Subsequently, there arose politico-religious conflict between those who embraced the new religion and those who remained faithful to the teachings of Bon (*Pon*),[1] the native shamanism of Tibet. This conflict culminated in the persecution of Buddhism during the reign of King Glang-dar-ma (*Lang-dar-ma*), who was assassinated in A.D. 842. The assassination led to schisms in the royal lineage and the final collapse of the Tibetan empire; while the persecution resulted in a hiatus in the oral transmission of the proper interpretation of the psycho-sexualized teachings of the annuttarayoga class of Tantras; consequently, the practice of the Tantras became degenerative.

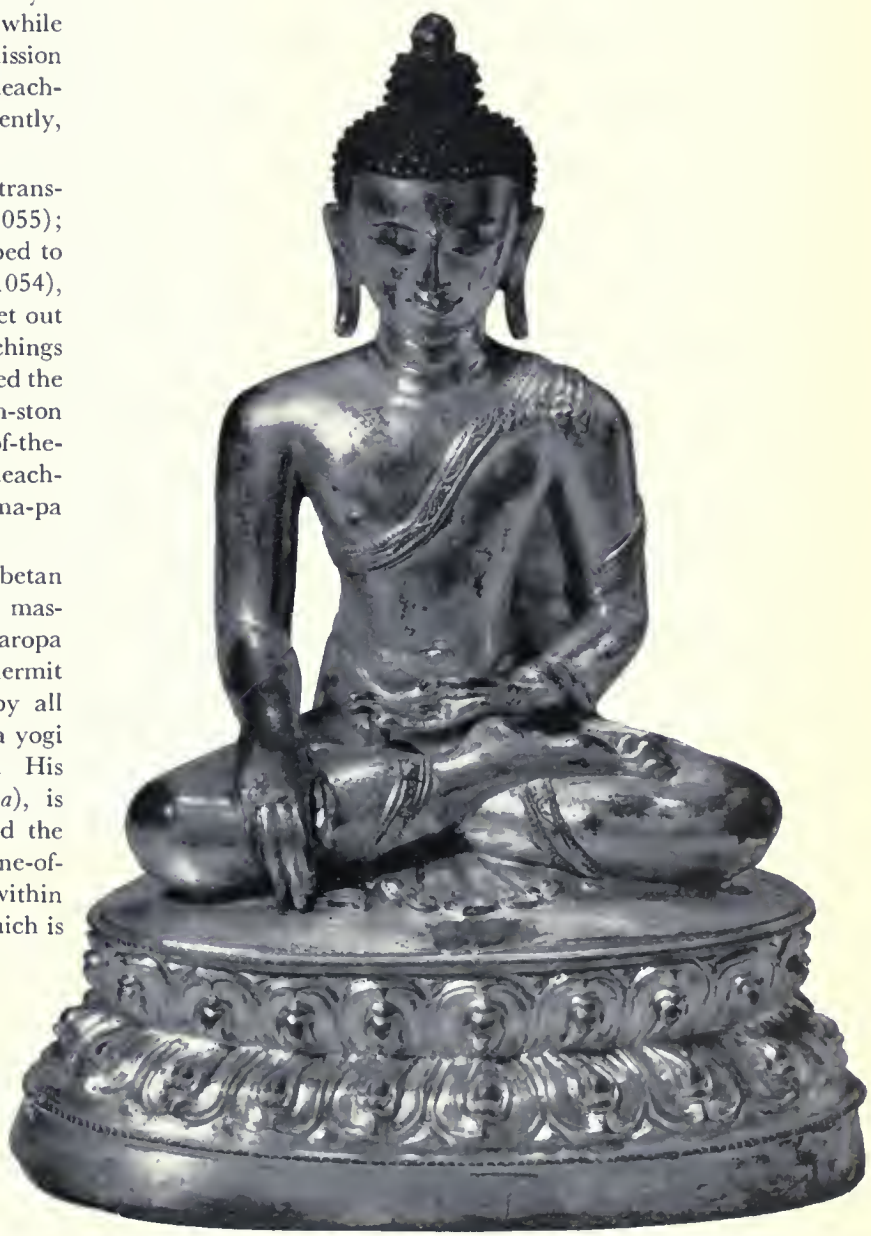
The renaissance of Buddhism is attributed to the translator, Rin-chen bzang-po (*Rin-chen sang-bo*) (958–1055); however, the emergence of sectarianism can be ascribed to the great Indian guru, Atisa Dípankarajñana (982–1054), who arrived in Western Tibet in A.D. 1042. Atisa set out to rectify the degenerate practice of the Tantric teachings and his chief disciple, 'Brom-ston (*Drom-don*), established the first reformed sect. The disciples of Atisa and 'Brom-ston called themselves Bka'-gdams-pa (*Ga-dam-ba*), "One-of-the-oral-instruction." The followers of the unreformed teachings of Padmasambhava were called the Rnying-ma-pa (*Nying-ma-pa*), "The-old-ones."

Not long after, two more major sects arose. The Tibetan translator, Mar-pa of Lho-brag (*Hlo-drak*) (1012–1097), mastered the teachings of the Indian gurus Tilopsa and Naropa and passed them on to his disciple, the great poet-hermit Mi-la-ras-pa (*Mi-la-re-ba*). Mi-la-ras-pa, revered by all Tibetans regardless of sectarian ties, is renowned as a yogi who achieved absolute enlightenment in one lifetime. His disciple, Dwags-lha Sgam-po-pa (*Tak-hla Gam-bo-ba*), is credited with the formulization of the teachings and the establishment of the Bka'-brgyud-pa (*Ga-gyu-ba*), "One-of-the-oral-lineage," sect. Several sub-sects developed within the Bka'-brgyud-pa school: the most influential of which is the Karma-pa (*Garma-ba*).

The Sa-skya-pa (*Sa-gya-ba*), "One-of-the-Whitish-earth," sect derives its name from the color of the soil where the original monastery was founded in 1073. Sa-chen Kun-dga' snying-po (*Sa-chen Gun-ga nying-bo*) (1092–1158) is revered as the founder of the Sa-skya-pa sect.

Various sub-sects and splinter schools developed in Tibet, but the last and most significant sectarian development

(Continued on Page 12)



Gilt bronze image of Buddha Shakyamuni

[1] Because of the frequent disparity between the orthography and pronunciation of Tibetan words, I give a phonetic approximation in parentheses after the first occurrence.

The publication of the Handbook of New Guinea Birds *by Austin L. Rand and the late E. T. Gilliard of the American Museum, has prompted a special exhibit entitled "New Guinea: Birds, Books and Stamps," on view in Field Museum's Hall 9 Gallery from December 8 through mid-January. The American Museum has the largest and best collection of New Guinea birds in the world and to facilitate the work on the* Handbook, *sent a representative collection to Chicago. In partial return, Field Museum is sending a collection of birds from Southern Asia, an area in which our collections are particularly strong. In the following article, Dr. Rand discusses the fascinating avifauna of the world's largest island.*

The Birds of New Guinea

by Austin L. Rand, Chief Curator, Zoology

New Guinea is a tropical island, 1500 miles long, lying just below the Equator. It is north of Australia and east of the East Indies. A backbone of mountains runs its length, the highest peak, Mt. Carstensz with snow on its summit, is 16,500 feet in altitude. The rich and diverse habitats: rain forest, lakes, swamps, and locally savanna and grasslands of the lowlands, wet evergreen forests of several types on the mountain slopes, and alpine grassland wherever the ranges rise above about 10,000 feet, all have provided a fertile area for the evolution of its rich bird fauna.

Often in meeting new people, one of the things you learn about them is whether their ancestors came to America on the *Mayflower*, or because of the potatoe famine, whether they lived in a log cabin, or fought at Hastings. Let us look at New Guinea birds from this point of view. Their ancestors certainly came from Asia. First, we will consider the

Five species of Birds of Paradise. Ribbon tailed Astrapia (top left), Blue Bird of Paradise (top right), Red Bird of Paradise (center left), Lesser Bird of Paradise (center right), Raggiana Bird of Paradise (bottom).

New Guinea–Australian avifauna together, for while the Austro-Papuan region has long been separated from Asia, with immigration hindered by the ancient water gaps in the East Indian Archipelago, New Guinea has only recently been separated from Australia by the shallow Torres straits, and the difference between the avifauna of the two is due to ecological factors, rather than ones of physical geography. New Guinea, as we have said, is dominated by a wet tropical climate and rain forest and evergreen mountain forests. Australia is dominated by subtropical and temperate, dry climate conditions and desert, grasslands and open woodlands.

Many large groups of Asiatic birds never reached the Austro-papuan region. Pheasants, trogons, barbets, woodpeckers, broadbills, bulbuls, and true finches are absent. On the other hand, the New Guinea–Australian area is remarkably rich in pigeons, parrots, kingfishers, cuckoo-shrikes, old world flycatchers and waxbills, all families well represented in Asia and the Sunda Islands. Eleven families have evolved in the isolation of the Papuan–Australian area: Cassowarys, Emues, megapodes, owlet-frogmouths, lyre birds, scrub birds, flowerpeckers, honeyeaters, bell magpies, mudlarks, birds of paradise, and bower birds. These are the results of ancient colonization at long intervals.

A few groups of Asiatic birds have sent colonists to New Guinea more recently: a crested swift, a hornbill, and a shrike, that have not yet reached Australia.

Some notable groups with headquarters in New Guinea rather than Australia are the birds of paradise of 43 species (four in Australia and one shared) Cassowaries, 3 species (one in Australia) Pigeon, 39 species (22 in Australia) Kingfishers, 19 species (10 in Australia) Flycatchers, 49 species (30 in Australia).

Australia, on the other hand, has, in addition to the emu and the scrub birds, many sea birds, not only of pan-tropical groups, but also those of southern waters, such as petrels and penguins.

At the species level, when New Guinea birds occur in Australia they are likely to be in the small areas of rain forest in Eastern Queensland; when Australian species occur in New Guinea they are likely to be in the limited savannas of south New Guinea.

About 650 species of birds, many of which are found nowhere else, have been recorded in New Guinea, which has an area of about 300,000 square miles. The richness of this avifauna is evident by comparing it with that of Australia, about ten times its size, but with only about the same number of species. North America, between Mexico and the Arctic Circle, is more than twenty times as big as New Guinea, but has only about 691 species of birds.

There are richer areas of comparable size, but they are parts of continental tropical faunas like Colombia in South America, with an area of 439,000 square miles and an avifauna of about 1556 species.

These figures graphically illustrate the richness of the humid tropics compared with arid and temperate conditions. There is another rule to consider: continents have more bird species than do islands, and larger islands have larger avifaunas than do comparable smaller ones. That New Guinea, the largest habitable island in the world, conforms to this rule is indicated by the figures in the following table:

New Guinea	300,000 square miles	650 bird species
Borneo	290,000 " "	540 " "
Java	48,000 " "	340 " "

Most New Guinea birds are forest species, but there are grassland, marsh, coastal, and water birds. The most interesting pattern of distribution is the altitudinal zonation of forest species. As one leaves the lowlands and goes up the mountains, species after species found at lower altitudes disappear and other species appear, some to be left behind in their turn until at timber line the birds of the forest are nearly all different from those of the lowlands. Thus:

Altitudinal distribution of Honeyeaters of the genus Myzomela

SPECIES	ALTITUDINAL RANGE
Mangrove myzomela	sea level only
Dusky "	" to 300 feet
Red spot "	" to 3,000 feet
Black "	" to 3,900 feet
Mountain "	2,700 to 6,000 feet
Black & red "	3,700 to 11,000 feet

Three Honeyeaters. Cinnamon-breasted Wattlebird (top left), spotted Xanthotis (top right), Red-backed Honeyeater (bottom).

The number of bird species found at different altitudes also decreases with altitude:

Bird species in the Snow Mountains, New Guinea

Sea level	(marsh, river, forest)	150 species
2,700 feet	(forest)	96 "
9,000 "	(forest)	65 "
11,000 "	(forest, marsha, lake)	50 "
12,000 "	(alpine grass & shrubbery)	14 "
13,000 "	(alpine grass & rock)	3 "

Another important biological aspect related to altitude is bird size. Where one goes from a warmer to a colder part of a bird's range, the individuals within a species tend to be larger. This has been codified as "Bergmann's rule" in relation to latitude, and correlated with area of surface vs. weight and reduction of heat loss. A similar change occurs within many species on the slopes of New Guinea Mountains, which also are colder at higher altitudes. Two examples of this are given in the following tables:

Increase in size with altitude

Swiftlet (*Collocalia hirundinacea*)

ALTITUDE	WING LENGTH
3,600–4,000 meters	129–135 mm.
3,225 "	121–128 "
2,200 "	121–124 "
1,600 "	118–120 "

White Cockatoo (*Cacatua galerita*)

ALTITUDE	WING LENGTH
1,200 meters	335–358 mm.
50 "	302–312 "

Palm Cockatoo

One might assume that if this increase in size with altitude were due to natural selection, that species as well as subspecies that have evolved at higher altitudes would be larger than those in the lowlands. But, this is definitely not true as the following figures show for parrots:

Wing length and altitude of parrots on north slope of Snow Mountain

	WING LENGTH (in millimeters)						
	61–70	81–90	91–100	101–160	161–190	191–365	Total
In lowlands	2		1	4	4	4	*15* (species)
At 1,200 meters	1		1	3	2	4	*11*
At 2,200 meters			2	3	1		*6*
Over 3,000 meters		1		3			*4*

As with parrots, in general the largest and the smallest species live at low altitudes, intermediate-sized ones at higher altitudes. Presumably, factors other than temperature operate. Rather, it correlates with the smaller size of the plants, the smaller spaces between them and the smaller size of insects and fruits the units of the birds food, at higher altitudes.

This would correlate well with the large birds at lower altitudes. The fact that the smallest species also live at low altitudes seems a contradiction at first, but it may be that larger species leave vacant small niches, which only small species can occupy. A more general statement might be that where one phyletic line has tended toward larger and larger forms, another has produced smaller ones to fill in the spaces between the big ones.

Single-wattled Cassowary

Some New Guinea birds reach unusual extremes in size, both large and small as the range in total length of the species in certain groups in the following table shows:

	Species		
Cassowaries	3	3½ to 6	feet high
Hawks	29	10 to 39	inches long
Gallinaceous birds	10	4¼ to 24	" "
Rails	18	6 to 23	" "
Pigeons	44	5 to 31	" "
Parrots	46	3 to 25	" "
Cuckoos	21	5½ to 27	" "
Kingfishers	24	4 to 16	" "
Songbirds	—	2⅞ to 22	" "

(But, the long-tailed astrapia, with body the size of a jay has a length of 46 inches.)

When we look over our collection of New Guinea birds, the incidence of bright colors seems very high. There are, of course, the birds of paradise to be mentioned later, but there are also the parrots (46 species) with red, yellow and green conspicuous in most species, with the exception of the white and the black cockatoos; the fruit pigeons, green with markings of red, orange, yellow, purple, pink or lavender in outlandish combinations; kingfishers with glistening light blue or pale blue, one with pink underparts, some vividly buffy yellow, some with rich rufous feathers; pittas with brilliant blue and red; yellow cuckoo shrikes, shiny blue fairy wrens; whistlers with vivid yellow; black and red honeyeaters, and a yellow, black and green flowerpecker, and another one that is blue and green.

Conspicuous and bright as these colors are in specimens, this is not true in the field. I've looked into a fig tree where I *knew* there were fruit pigeons, but couldn't see one, until I clapped my hands and a dozen flew out. The bright lories

climbing about in a flowering epiphyte are no more conspicuous than brown rats would have been. Bright yellow flycatchers and flowerpeckers among the leaves seem no more conspicuous than their duller relatives. It is as though the birds are protected by the foliage in which they feed so that natural selection had relaxed its severity and allowed colors to run riot as they do among the fishes of a tropical coral reef.

Of all the birds that have bright colors, the birds of paradise stand out, even when compared with fancy pheasants from Nepal, quetzals from Guatemala, or the cock of the rock from Venezuela. If you prefer bright, gaudy yellows, oranges, reds or blues, look at the King bird with a spun glass quality to its red back; the long, orange plumes of the raggiana bird of paradise or the blue plumes of the blue bird of paradise. If you prefer metallic colors, backed with black, look at the superb, and the astrapias with patches of iridescent green, blue, purple, bronze, violet, and flaming copper.

The birds of paradise are notable not only for their colors, but also for their exaggerated display plumes which bear some of the colors: these decorations take the form of elongated breast shields, flank plumes, neck ruffs, and wire-like plumes with or without flags at the tip on head, flanks or tail. These, of course, are the decorations of the male and used in his displays, each according to his kind, singly or in parties, on the ground or in undergrowth, or in tree tops.

By comparison, the bower birds are dull, brownish, tawny, or blackish, although two have long, yellow-orange crests. Their displays take an architectural form, which

Victoria Crowned Goura Pigeon

appears only in a primitive way in the cleared arena in which some of the birds of paradise display. The gardener bower bird actually builds a tepee-shaped "hut" and decorates a "garden" in front of the door with bright bits of flowers and shells. These birds, of course, are polygamous, the plain female carrying on all nest duties, as is also true for the birds of paradise.

There are other odd decorations on New Guinea birds: the head wattles of the brush turkey, certain starlings, a shrike-tit, and some birds of paradise, the wrinkles on the base of the hornbill's great bill, and the long, central tail feathers of some kingfishers and lories. Crests, too, appear time after time; shaggy crest of the great black cockatoo, the trim yellow crest of the white cockatoo, the long head fan of the goura pigeon, and the sharp crest of the demure crested berrypecker. A few small parrots have elongated fan-like tufts on the sides of the head.

The oddest shaped birds are perhaps the owlet frogmouths and frogmouths. The frogmouths are large, 13–21 inches long and colored like an owl in complicated patterns of brown, gray and black, have an enormous gape (from which they take their name) with a heavy, horny rim about it. They are wonderful examples of omnivorous feeders, eating large insects, frogs, lizards, mice, and small birds. Nocturnal birds, they sit up on branches in the daytime and may point their bills skyward, as though imitating broken-off stumps, which they resemble in color.

Great Papuan Frogmouth

The owlet-frogmouths are similar, but are smaller and more delicately made birds. They are even more owl-like but without hooked bills. Five of the seven known species live in New Guinea (2 in Australia). They may spend the day in holes in trees, but they are so secretive that almost nothing is known about their habitats, and specimens are so few that just how many species there are is a problem.

Among birds with peculiar methods of feeding and related structures, there is the kingfisher with a big shovel-shaped bill that digs worms from the soil of the forest floor, the hornbill with a great bill that helps lengthen his reach to get fruits from small twigs in the tree tops as the toucan does in tropical America. There are the flower-feeding brush-tongued lorys in which the tongue spreads out like a brush to sweep up nectar and flower parts, and the brush-tongued honeyeater whose tubular tongue is used to suck up nectar. A tiny parrot climbs over the trunk of a forest tree seeking the wood fungus on which it feeds. A flowerpecker that feeds on sweet berries has its stomach so reduced that it is non-functional for berries. They go right on into the intestines for digestion. The bird sometimes eats spiders

(Continued on page 14)

was the reformation carried out by Tsong-kha-pa (*Dsong-ka-ba*) (1357–1419). Originally a follower of the Bka'-gdams-pa sect, Tsong-kha-pa founded a new reformed sect, which became known as the Dge-lugs-pa (*Ge-luk-ba*), "One-of-the-virtuous-system." To distinguish themselves from the other unreformed clergy, members of the Dge-lugs-pa wore yellow hats instead of the traditional red ones of other sects; hence, the name "the Yellow Hat sect."

By the middle of the 17th century, the Yellow Hat sect had risen to political supremacy through the military assistance of the Qosot Mongols and the Dalai Lama became the spiritual ruler of Tibet. The concept of the "incarnate lama," a development unique to Tibetan Buddhism, arose in the 14th century in the Black Hat Karma-pa sect and was soon adopted by the other sectarian groups. An "incarnate lama" is believed to be a physical manifestation of the absolute Buddhahood emanated for didactic purposes. Although the Dalai Lama is regarded as the highest spiritual emanation of Buddhahood in Tibet due to his position of temporal ruler, each sectarian group looks to its head lama for doctrinal guidance and authority.

Maitreya, the Coming Buddha, holding the stem of a lotus in each hand.

Silver image of Avalokitesvara, god of compassion, the most highly revered deity in Tibet. This is the form that is incarnate in the Dalai Lamas.

There are some general differences between the reformed Dge-lugs-pa, the semi-reformed Bka'-brgyud-pa and Sa-skya-pa, and the unreformed Rnying-ma-pa. The Rnying-ma-pa accept Kun-tu-bzang-po (*Gun-du sang-bo*) as the Adibuddha, and they revere Padmasambhava as the "Second Buddha." The other three sects accept Rdo-rje-'chang (*Do-je-chang*) as the Adibuddha. Celibacy is mandatory on all Dge-lugs-pa initiates; optional for those other than fully-ordained monks of the Sa-skya-pa and Bka'-brgyud-pa; and of no dogmatic significance whatever to the Rnying-ma-pa.

In addition to the general characteristics, there are subtle and profound differences between the four major sectarian groups in regard to: (1) the lineage of the gurus, (2) the basic doctrinal text, (3) the special tutelary deity, (4) the particular defender-of-the-faith, (5) the ontological view of absolute existentiality, and (5) the fundamental tantric text. Due to the brevity of this paper, a detailed listing of the first four characteristics is not possible; therefore, only the last two will be reviewed.

There are two ontological views propounded in the Dbu-ma (*U-ma*) (Sanskrit: Madhyamika) Buddhist teachings propagated in Tibet. The first is the rang-rgyud-pa (*rang-gyu-ba*), or "self-essense" (svatantrika) view, which maintains that phenomenal objects perceived by the senses do not exist *per se*, but they do have ontological "self-essence" because they are constituted from the four basic elements: earth, water, fire, and air. The second is the thal-'gyur-pa (*ta-gyu-ba*), or "association" (prasangika) view, which states that phenomenal objects are devoid of any existence in truth and even the four elements are compounded and, therefore, impermanent and relative concepts. According to the "association" view, the nature of the state of absolute existentiality is beyond all conceptualization. The true nature of all things is unknowable and indefinable. For the sake of didactic communication, it is called Stong-pa-nyid (*Dong-ba-nyi*), "Devoidness" (Sanskrit: sunyata).

Besides the ontological views of the Madhyamika system, there is the Sems-tsam-pa (*Sem-dsam-ba*), or "Mind-only" view of the Yogacara system of Buddhism, which, like subjective idealism in Western philosophy, denies the existence of phenomenal objects external to the observer. The "mind-only" school, which is the fundamental teaching of Zen Buddhism, was rejected during a debate on ontological views held at the monastery of Bsam-yas (*Sam-ya*) in the 8th century and only the Madhyamika views were considered orthodox for Tibetan Buddhism.

The following illustrates the differences in the arguments put forth by the ontological views mentioned. The ordinary individual says, "This is a wheel. It exists because I can see it and grasp it." The "mind-only" view says the wheel has no existence other than the illusion of wheel produced in the mind by discursive thought. The "self-essence" view

says the wheel does not exist, because the word 'wheel' is a relative abstraction. Scatter the wood and nails of the "wheel" over the ground and the "wheel" is no longer perceived. The wood of the "wheel," however, does have "self-essence" for it is constituted of the four elements, which do exist. The "association" view maintains that the wood has no "self-essence" because even the four elements are compounded and, therefore, relative abstractions. The self-nature of the wood in its state of absolute existentiality is the unknowable "devoidness" (Stong-pa-nyid).

Another way of explaining the absolute state of "devoidness" is to use the atomic theory of modern science. All phenomenal objects are made up of atoms. An atom is nothing more than positive and negative charges of electricity whirling about each other. "Positive" and "negative" are relative terms of reference. What then is the nature of that absolute state of existentiality out of which "electricity" comes? The answer, according to the "association" view of the Madhyamika Buddhist doctrine, is: *Stong-pa-nyid*—the unknowable, indefinable, "devoidness."

Regarding the views of the four sectarian groups in Tibet, the Dge-lugs-pa and Sa-skya-pa teach only the Thal-'gyur-pa ("association") view. The Bka'-brgyud-pa teach the Rang-rgyud-pa ("self-essence") view in the lower levels, but abandon it for the "association" view at the higher levels teaching. The Rnying-ma-pa are said to combine the "association" view with that of the "mind-only" system. In the 17th century, the Jo-nang-pa, a sub-sect of the Sa-skya-pa, was all but obliterated from the Tibetan monastic scene by the orthodox Dge-lugs-pa because it stressed the "mind-only" view in its teachings.

Monk wearing the yellow hat of the Gelugpa sect. In his left hand is a rosary, in his right hand a censer, and hanging from his belt is a brocade case that conceals a tiny holy water bottle.

Before discussing the issue of the fundamental tantric text it is necessary to clarify the distinction between the so-called "right-handed" and "left-handed" tantras, both of which are found in the annuttarayoga class and both of which utilize sexual symbolisms for psychological processes. The "right-handed" tantras are based on the mandala of the Five Buddhas of Meditation, with Vairocana as the central deity. These tantras were introduced from Kashmir.

The "left-handed" tantras are based on a mandala of female partners (yogini), usually nine in number, with the Aksobhya Buddha as the central deity. These tantras were introduced from Nepal and are considered unorthodox by the reformed Dge-lugs-pa sect.

Tibetan nomad dressed in a traditional chupa, or long robe, carrying a charm box that holds an image and paper charm for protection against demons, disease, bullets and other misfortunes.

The Rnying-ma-pa regard almost any tantric text as being acceptable, but the Dge-lugs-pa accept only four tantras and all of these are of the "right-handed" Vairocana type. The Bka'-brgyud-pa select from both the "right" and "left-handed" tantras; while the Sa-skya-pa accept, in addition, some of the Rnying-ma-pa tantric teachings. Ritually, the Sa-skya-pa are close to the Rnying-ma-pa. This is undoubtedly due to the origin of the Sa-skya-pa teachings. The founder of the Sa-skya monastery and father of the formulator of the Sa-skya-pa doctrine was a Rnying-ma-pa lama. Many of the ritual objects, together with their ceremonies, are rejected by the Dge-lugs-pa, but utilized by the other three sects. Thus, the paradox exists that the reformed Dge-lugs-pa and the semi-reformed Sa-skya-pa are close on the issue of philosophy, but apart on the question of ritual practices.

In conclusion, then, one often reads about Tibetan sectarianism as the "Yellow Hat Sect" opposed to the "Red Hat Sect"; or, the "reformed sect" versus the "unreformed"; but, there are, in fact, many fundamental differences between the four major sectarian groups in Tibet, not to mention the various sub-sects.

SELECTED BIBLIOGRAPHY

Conze, Edward, *Buddhism: Its Essence and Development*, Harper Torchbooks, New York, 1959.

Evans-Wentz, W. Y., editor, *Tibetan Yoga and Secret Doctrines*, Oxford University Press, 1967.

Guenther, Herbert V., *Tibetan Buddhism without Mystification*, E. J. Brill, Leiden, 1966.

Hoffman, Helmut, *The Religions of Tibet*, London, 1961.

Snellgrove, David, *Buddhist Himalaya*, Oxford, 1957.

Tucci, Giuseppe, *Tibetan Painted Scrolls*, 3 vols., Rome, 1949.

Waddell, L. Austine, *The Buddhism of Tibet or Lamaism*, Cambridge, reprinted 1958.

and when it does, these go into the reduced stomach and receive the same treatment that most birds' food gets.

For peculiar nesting habits, there is the megapode who scratches up a great mound on the forest floor in which it lays its eggs to be incubated by the heat of the decaying vegetation. The young hatch down covered, dig their own way out, and independently go their way, never knowing a mother's care. Many parrots in other parts of the world dig nests in termite mounds and in tree trunks as do New Guinea species, but one New Guinea species digs its burrow up, instead of down, and then changes direction and finally excavates the nest chamber above the entrance, a system that certainly would keep out tropical rains.

Vulturine Parrot

It is well known that sunbirds, of which only two reach New Guinea, build pendant, dome-shaped nests. But, it seems to have escaped most bird students that in building this nest, most of the material is added from the inside. Near the mouth of the Fly River, I watched a nest being built. First, the female made a loose pendant strand of spider web and plant material; then she forced her way into it and added material on the inside as the walls became thinner while she forced them out to the proper shape and size.

One of the swiftlets nests in the complete darkness of deep caves. There it glues its nest to the wall, lays its eggs, and raises its young. It feeds the young insects caught on the wing during the day above the forest. Presumably, the swiftlet is able to use echo location to guide its flight, and find and recognize its nest in complete darkness as the oil bird of South America does, and similar to the way bats use echo location.

These swiftlets are relatives of the Asiatic swifts whose nests, made wholly of saliva, furnish the basic ingredient of the Chinese bird nest soup. The nests of these New Guinea birds, little shelves glued to the cave wall, also contain saliva, but they contain so much plant material in addition that their use for soup is impractical.

Of course, some of the cuckoos lay their eggs in foster parents' nests, as our cowbird does, and the hornbill female

Papuan Hornbill

is sealed into the hole in a tree with her eggs, to be fed during incubation through a slit left in the doorway by the male.

* * *

It was more than thirty-five years ago when I first walked in a New Guinea forest, collected bird specimens there, watched birds of paradise displaying and wrote accounts of their habits. In the writing and publishing of *Handbook of New Guinea Birds*, there were a long series of delays and disheartening events, including such things as the repudiation of our contract by one publisher, and the mislaying of the original color art work by another. These brought back to my mind the obstacles to field work in New Guinea. We had a saying, "In New Guinea, if anything *can* go wrong, it will!" A Catholic Mission Brother of the back country put it more concretely, "If you have the lamp you do not have the kerosene; if you have the kerosene you do not have the lamp. It is Papua." This was in the old days when we travelled on foot, with carriers, in unmapped country; we had escorts of police or soldiers for protection. Only half in jest we said the old gods were jealous.

There were changes coming, but belief in the old was still strong. One evening, on the upper Fly River, when the new moon was very young the cook boy left off singing a methodist hymn to come and complain that the second cook was working magic to do him harm. The second cook said, not so. True, he was working magic with a sweet potato and a piece of broken bottle, which he showed me, but these and the words he had been saying were used in his village in the far distant d'Entrecasteaux Islands to insure that the new moon would safely ride across the sky.

In the present-day scene in which the emerging world of the Papuan preparing for independence is linked to the sophisticated world of Chicago by airplane and radio, there would seem to be no room for malign spirits. Yet, in October, a tape-recording of New Guinea bird voices, sent from Port Moresby, New Guinea through the kind offices of Mr. W. S. Peckover, arrived for use in our exhibit. It was completely blank. An explanation was found, of course, involving the U. S. Customs, an X-ray search for contraband, and magnetic fields. Later, Mr. Peckover sent a replacement tape which arrived unscathed.

In these days of bird-watching tours, a comment on possibilities in New Guinea is in order. The amateur bird watcher who lands at Port Moresby in Southeast New Guinea can drive through the savannas to Rouna Falls on the Laloki River, twenty-two miles distance, in less than an hour and be on the edge of the rainforest where birds of paradise display. The Laloki Canyon presents some of the most spectacular views in New Guinea. To give an idea of what one may see, I can point out that the late Dr. E. T. Gilliard spent February 7 – April 11 in this area studying birds and collecting material for a bird of paradise group now installed in the American Museum of Natural History in New York. He published a list of about 140 species he saw in the general area. These included 13 species of pigeons, 11 parrots, 9 kingfishers, 5 cuckoo shrikes, 10 flycatchers, 9 birds of paradise, and 8 honeyeaters.

In the above, the unusual aspects of the avifauna have been stressed, but the visitor from the new world will see many birds similar in shape and feathering to those he knows, even if they differ in color, pattern, and detail of structure to indicate they may not be closely related.

In the forest are perching birds, rails, pigeons, megapodes, that walk over the forest floor; kingfishers, warblers, flycatchers, fairy wrens, shrike-like and whistler-like birds share the undergrowth and low trees. Nuthatch-like and creeper-like birds climb on the tree trunks; other warblers, flycatchers and vireo-like whistlers gleaning insects from leaf and twig. Perched on trees above the forest and sailing out for insects are the black and white wood swallows and the demure grey and black-crested swifts.

The flower feeders and fruit eaters of the tree tops reach a particular richness here that is hardly surpassed even in the American tropics. There are parrots and lories, pigeons, honeyeaters, flowerpeckers and berrypeckers, birds of paradise, and starlings, which may swarm into a tree top in bewildering numbers and variety.

Much of the above data on birds, and more, is in the *Handbook of New Guinea Birds*, in a systematic, species-by-species arrangement. The writing of the *Handbook* took three years, and publication, several more. This has had some unexpected side effects. One was a request to write an article on birds of paradise for the English magazine, "Animals." Another was in connection with the issuance of four New Guinea stamps, each with the picture of a parrot, by the postal authorities in Port Moresby. They wanted a brochure describing the pictured parrots. The late Dr. Gilliard had already done one for an issue of birds of paradise stamps. I was asked to do the one for parrots. First day covers with the four parrot stamps on them were issued in Port Moresby on November 29.

The special exhibit entitled "New Guinea: Birds, Books and Stamps" is on exhibit in Hall 9 of the Museum. It shows a selection of the more striking bird specimens received by the exchange, the *Handbook* we helped to prepare, and some of the side effects of the research, such as the first day covers with parrot stamps.

Winter journey

Magic, Medicine and Minerals

TODAY we take for granted man's ability to hurl himself into space; to dig, by remote control, in the surface of the moon. It is too easy for us to forget the awesome aspect which the physical environment presented to man in his pre-scientific stage. Lacking knowledge of scientific laws he deified natural forces and turned to an organized system of superstitious beliefs to explain the unexplainable, to understand the unknowable. Slowly he crawled up from this quagmire of superstition. He stands now at almost the extreme opposite position, exhibiting an almost child-like faith in the ability of twentieth century science and technology to solve the many pressing problems relating to man and his environment.

Only a tick ago on the geological clock, man believed that minerals possessed powers which could cure disease, protect from danger, and insure success in all undertakings. Chalcedony, the lapidaries informed us, warded against drowning and being tempest-tossed. The color of an opal faded when worn by the deceitful, but united the special virtues of all gems when worn by the innocent. Jade was prescribed for kidney diseases, while garnet prevented fever, and made its wearer agreeable, powerful and victorious. Such beliefs have prevailed from earliest times, but were especially prevalent during the Middle Ages. Medieval books on minerals—called lapidaries—were essentially handbooks of magic and medicine. From such beginnings arose the science of mineralogy, hastened by the rise and widespread development of the mining industry in Europe.

The Winter Journey will provide boys and girls, indeed the whole family, a chance to explore what to them may be a hitherto unsuspected chapter in the natural history of the mineral kingdom. As you learn of the superstition you will see in the Geology Halls actual examples of the mineral involved. Optional visits to the Gem Room, Hall of Jades, and some of the Anthropology Halls will provide an opportunity to see some of the finest examples of the lapidary art, both ancient and recent. A wide variety of gem minerals is worn today solely for their intrinsic beauty.

The current Journey is No. 52 in a series begun in 1955. With the successful completion of each four journeys, boys and girls are awarded a certificate and title: Museum Traveler (4 journeys); Museum Adventurer (8 journeys); Museum Explorer (12 journeys). After 16 journeys have been completed the Explorer becomes a Beagler, ready to undertake a special journey which carries him throughout the Museum to study some of the natural history materials observed by Charles Darwin on his famous "Voyage of the Beagle." Successful Beaglers are awarded a certificate making them members of the elite Museum's Discoverer's Club.

There is no charge for taking any of the Museum Journeys. Copies of the Journey question sheet and further information on the program may be obtained at the North or South Door or at the Information Booth. The Winter Journey runs from December 1 to February 29.

—by Ernest J. Roscoe, Raymond Foundation

JOIN THE MEXICAN TOUR

PLACES are still open in Field Museum's Mexican Tour, scheduled April 4–21, according to Phil Clark, Tour Leader.

The Tour, guided by Field Museum specialists in archaeology, horticulture and botany, will explore Mexico in its many varied dimensions: Aztec, Toltec, Zapotec and Maya ruins, and the mysterious Olmec sculptures, forceful mural art and revolutionary architecture, Spanish Colonial and strikingly modern private homes and colorful tropical gardens, wild plants in settings of pine-forested mountains and tropical rain forest, the exciting pageantry of Holy Week's processions and Passion enactments and the flowering trees which dominate the April landscape.

Major distances within the country will be covered by plane, supplemented in each area by probing trips by motor coach—"to fully see the country, but with an economy of time and maximum of comfort," according to Mr. Clark. Principal stops will be at Mexico City, Teotihuacan, Cuicuilco, Cuernavaca, Xochicalco, Taxco, Oaxaca City, Monte Alban, Mitla, Santa Maria del Tule, Villa Hermosa, Palenque, Merida, Uxmal, Kabah and Chichen Itza.

Olmec sculpture in the Villahermosa, Tabasco

Price, including all meals, hotels, transportation and expenses, and a tax-deductible $200 donation to Field Museum, is $975. The full itinerary appeared in the October, 1967, issue of the BULLETIN. Reservations, including a $200 deposit, may be mailed to Field Museum's Mexican Tour, Field Museum.

CALENDAR OF EVENTS

Closed on Christmas and New Year's Days. Hours for December and January are 9 a.m. until 4 p.m. weekdays; until 5 p.m. weekends and during the week of December 26th.

December through February Winter Journey: MAGIC, MEDICINE AND MINERALS, a self-guided tour concentrating on the mythology of gemstones.

December 1 Lecture: TIBETAN BUDDHISM by Turrell V. Wylie, Associate Professor of Tibetan Languages and Civilization at the University of Washington, Seattle. 8:30 p.m. in the Lecture Hall.

December 8 through Mid-January Exhibit: NEW GUINEA: BIRDS, BOOKS AND STAMPS with commentary written by Dr. Austin L. Rand, Chief Curator of Zoology.

December 16 CITY-WIDE YOUTH ORCHESTRA CONCERT. The Orchestra, composed of 50 Chicago area youngsters, aged from 12 to 17, is under the leadership of Mrs. Fanny Hassler and sponsored by Chicago Park District. The program includes music by Franck, Brahms, Tchaikovsky and Mendelssohn. 2 p.m. in James Simpson Theatre.

December 17 Audubon Wildlife Film: THREE SEASONS NORTH, by D. J. Nelson. A color film of a family back-packing into the lake country of British Columbia. 2:30 p.m. in James Simpson Theatre.

MEETINGS:
NATURE CAMERA CLUB OF CHICAGO, Dec. 12, 7:45 p.m.
ILLINOIS ORCHID SOCIETY, Dec. 17, 2 p.m.
SIERRA CLUB, Great Lakes Chapter, Dec. 19, 7:30 p.m.

DR. PRESS TO GIVE HOLIDAY LECTURES

DR. FRANK PRESS of M.I.T. will deliver the 6th annual series of Holiday Science Lectures on December 28 and 29. These lectures, entitled "The Internal Constitution of the Earth," are presented by The American Association for the Advancement of Science in cooperation with Field Museum. Eight hundred high school students who have demonstrated interest and outstanding ability will be invited, with their science teachers, to hear the four talks.

Dr. Press is currently the Chairman of the Department of Geology and Geophysics at M.I.T. In addition to University positions, he has worked with government panels and committees, including programs to develop seismic methods of policing nuclear tests and to create an earthquake warning system. Dr. Press's principal research activities are in the fields of crustal and mantle structure, earthquakes and seismology, exploration geophysics, planetary physics, submarine geology and theory of elastic wave propagation.

The general purpose of the Holiday Lecture Series is to impress selected high school students with the excitement and inspiration of scientific research. In past years, both students and teachers have been very enthusiastic about this event in Field Museum's educational program.

FIELD MUSEUM
OF NATURAL HISTORY
ROOSEVELT ROAD AT LAKE SHORE DRIVE
CHICAGO, ILLINOIS 60605 A.C. 312, 922-9410
FOUNDED BY MARSHALL FIELD, 1893
E. Leland Webber, Director
BULLETIN
Edward G. Nash, Managing Editor